Charles University in Prague

Faculty of Social Sciences
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MASTER THESIS

Inflation targeting in dollarized economies

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Abstract

Inflation targeting has become an increasingly popular regime among emerging markets. Focusing on the experience of inflation targeting adoption in the countries in Central and Eastern Europe and Commonwealth of Independent States, this thesis highlights the main features of the inflation targeting framework. A clear economic condition bringing these countries together is considered the dollarization issue which gains importance when designing the inflation targeting framework. The empirical study on the impact of inflation targeting in inflation, inflation volatility, output, output volatility and deposit dollarization shows clear benefits of inflation targeting in terms of inflation and inflation volatility, which are not achieved at the expense of output growth. Also, dollarization does not harm the positive impact of inflation targeting on inflation.

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Acronyms

CB	Central Bank
CEE	Central and East Europe
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
IT	Inflation Target

Master Thesis Proposal

Proposed Topic

Inflation targeting in dollarized countries

Topic characteristics

My thesis will focus on the impact of the inflation targeting in dollarized countries like: Serbia, Albania, Georgia, Moldova, etc. Inflation targeting is a monetary policy regime that was first used in New Zealand in 1990 which was followed by many other developed countries. The aim of this monetary policy is to achieve price stability through targeting directly inflation and not any intermediate variable. Many studies have been conducted to analyze the process of inflation targeting in developed countries and some others have compared the experiences of the inflation targeting in developed and emerging markets. My thesis aims to study how the inflation targeting has been implemented in dollarized countries in our region and its impact on the macroeconomics performance of these countries. The time since the adoption of the IT in these countries is short, and makes any analysis of the situation preliminary, but the thesis aims to view the impacts of IT on output, volatility of exchange rates, interest rates, international reserves and output growth. Also, an emphasis will be put on the change in credibility and the issue of preconditions in these countries.

Hypotheses

My hypotheses regarding the inflation targeting in dollarized countries are the following:

1. The level and volatility of inflation prior to the adoption of IT is higher than after the adoption.

2. Inflation targeting causes a reduction on the level of inflation expectations.

3. Inflation targeting is accompanied by little or no effect on output volatility.

4. Inflation targeting improves the macroeconomic performance.

5. Inflation targeting improves the inflation situation more than other monetary policy regimes.

Methodology

Since I want to determine the impact of the inflation targeting on the macroeconomic performance of these countries, I will use difference-in-difference method to control for the reversion to the mean. This method consists in regressing the difference of an economic variables affected by IT in the period before and after the adoption of IT to a dummy variable for targeters. The economic variables that will be taken into consideration are: inflation level, inflation volatility, inflation expectations, real GDP growth and the growth volatility. The time period will be divided into pre- and post- period for IT adoption. All countries with a hyperinflation periods of over 50% will be removed from the sample.

Outline

1. Introduction: What is inflation targeting?
   (a) The definition of inflation targeting
   (b) The advantages and disadvantages
   (c) Preconditions for the adoption of IT
2. Comparison with alternative monetary policies
   (a) Alternative monetary policies: Exchange rate targeting and Monetary targeting
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3. Emergence of IT in dollarized countries (short descriptions - case studies)
   (a) Serbia
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4. Theory and empirical methodology
   (a) Theory

(b) Empirical methodology

(c) Data and diagnostics

(d) Models

(e) Empirical results and assessment of impact

5. Conclusion

Core bibliography

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Chapter 1

Introduction

1.1 Origins

To assure low and stable inflation, generally associated with a healthy economy and long run growth, economists have been on the quest for a successful monetary policy which anchors inflation expectations correctly. Moreover, they aim for this monetary policy to be flexible enough in response to shocks and still keep the credibility of the regime. In the past two decades, inflation targeting has been chosen by an increasing number of countries as their monetary policy framework. The first country to adopt inflation target was New Zealand in 1989 and was followed by many other industrial countries like United Kingdom, Sweden, Finland, Australia, Israel and Spain. By the start of 2013, 29 countries are considered inflation targeters, while there are several other emerging countries in the process of adopting it, having adopted only some aspects of this regime. Spain, Finland and Slovak Republic are the only countries which quit inflation targeting as they started the process of euro adoption. Despite the initial trend of adopting inflation targeting in developed countries, some transition economies like Czech Republic, Hungary and Poland also adopted it by mid 90's.

In general, inflation targeting was adopted after the failure of other monetary policy regimes. Prior to inflation targeting, the nominal anchor was chosen to be either the gold standard or fixing the exchange rate of the domestic currency to a foreign one. Under inflation targeting, the main goal of the central bank is to achieve price stability through a nominal anchor.

This master thesis aims to provide an analysis of the existing literature regarding the impacts of inflation target in the macroeconomic performance of

inflation targeting economies and show some new empirical results regarding the outcomes of adopting inflation targeting in dollarized economies in Central and East Europe and Commonwealth of Independent countries. Most of these countries have recently moved to democratic systems and are still reforming their institutions to work with current situation. More importantly, they are becoming essential countries for the region, making the study of their monetary policy interesting. The thesis aims to focus on the impact of inflation targeting in these countries, accounting for dollarization. Although most of the countries adopting inflation target have tailored it to their environment, empirical analysis and generalized conclusions are still possible.[1]

This master thesis is organized as following. Chapter one presents a general definition of inflation targeting together with some general characteristics, advantages, disadvantages and the preconditions to be met. Chapter two provides a comparative analysis between different monetary policy frameworks, while chapter three shows a general overview of the literature regarding dollarization and emphasizes the importance of dollarization on the adoption of inflation targeting. A short glance on the rationale for adoption of inflation target and general performance of each targeting country is presented in chapter four, while chapter five includes a survey of general literature on inflation targeting during the past 22 years. The empirical study is presented in chapter six and includes: description of data, country and period samples, methodology, robustness check and conclusion. Chapter seven summarizes the main ideas and conclusions.

1.2 What is inflation targeting?

The simplest definition of inflation targeting would describe it as a monetary policy strategy aiming price stability. However, this would not be enough. Since 1989, when it was introduced, several definitions have been provided differing in details but generally viewing inflation targeting as a framework in which central bank maintains the level of inflation announced publicly during a medium-term period. In the general literature, an inflation targeting central bank is characterized by four main characteristics (Mishkin 2001; Roger 2010):

[1] See Bernanke and Mishkin (1997).

- Defined quantitative targets for inflation in medium term are publicly announced by the central bank;
- Central Bank's main goal of monetary policy is to achieve price stability;
- Central bank is required to be highly transparent and accountable during the implementation of the monetary policy and its performance in achieving the target. Central Bank continuously communicates to the public the objectives set, decisions taken by the bank authorities and outcome;
- The policy framework of the central bank would focus on future inflation by taking into account a lot of information in defining the settings of policy instruments.

To further explain the framework of inflation targeting, Bernanke and Mishkin (1997), used the term 'constrained discretion' which expresses the coexistence and tradeoff between rule and discretion in this framework. They point out that inflation target does not set strict rules to central banks, but allows them to use their judgment and models together with all the necessary information to achieve the inflation target. Following the same popular definition of 'constrained discretion', Svensson (1998) argued that on one hand, inflation target clearly sets goals, duties, and defines the responsible and accountable party for achieving the target but on the other hand, it allows the central bank enough flexibility to choose the monetary tools and use them according to its judgment to achieve the target and properly react to short term unexpected events in the economy. However, it is worth noticing that despite several definitions on inflation targeting, the general belief is that it is not a new policy regime since it includes the main positive elements of different monetary policy regimes (Petursson, 2005).

The next question to be posed is 'when an economy is considered an inflation targeter?' It is accepted that for a country to be classified as an inflation target, it is not enough to just announce a numerical value and declare price stability as its main objective of the monetary policy. Many countries build a practice of announcing inflation targets but continue to adopt either monetary targets or exchange rate targets unlike fully-fledged inflation targeting countries which adopt inflation targeting as their main policy objective. Also, defining price stability the main objective of the monetary policy does not make an economy inflation targeting since most of the central banks nowadays have price stability as a goal. A clear example is the European Central Bank (ECB) which declares

to aim keeping inflation at a rate below 2% but it is not considered an inflation targeter.

Loayza and Soto (2002) explain that one should be careful when considering a country an inflation targeter because it affects the evaluation results of the monetary framework. A broad definition would include many countries which have characteristics of inflation target and overstate the effects of monetary policy. However a narrow definition would under-evaluate the effects of inflation targeting. In this thesis, inflation targeting countries are considered only those countries whose central banks publicly state inflation target as their monetary policy framework.

A general classification on inflation targeting regime provided by Carare and Stone (2003) answers the question above. There exist three types of inflation targeting: fully fledged inflation target, implicit price stability anchor, and inflation targeting lite.

- *Fully fledged inflation target* is the kind of inflation target adopted and announced by the central banks which are usually characterized by good credibility, commitment, and transparency in adoption of the framework. These banks publish the forecasts of inflation together with the policy actions to be undertaken. Not only developed countries like New Zealand and United Kingdom, but also emerging markets like the Czech Republic, Hungary and Poland are considered fully fledged inflation targeters.

- *Implicit price stability anchor* is used by central banks with high level of credibility and a history of stable and low inflation. These central banks can ensure price stability even though they are not highly transparent and accountable to public regarding monetary policy. European Central bank is such an example.

- *Inflation targeting lite* is typical for central banks with low level of credibility which announce broad inflation targets and face difficulty to fulfill the objectives of inflation target. The most frequent difficulties faced by them are: short term shocks, undeveloped financial markets, macroeconomic instability and high level of dollarization.

Another debate emerges over the adoption date of inflation target. While for the developed countries the adoption dates are somehow clear, for many emerging countries they are not clear since some of them may have used other policy targets in addition to inflation target and the transition towards the

dominance of inflation target took some time. Some studies consider as adoption date the date when the target was announced, while other studies consider the date when all the necessary features for adoption of IT were in place.

Vega and Winkerlried (2005) argue that based on the ways of considering adoption dates targeting emerging countries can be divided into two categories. Soft IT are the economies which have started to adopt some kind of IT while fully fledged IT are the economies whose central banks have announced publicly a numerical target. They argue that most of the emerging market economies which suffered from periods of high inflation, decided first to use soft IT and bring inflation down to low levels before fully adopting inflation targeting framework. Table 1.1 [2] shows the different adoption dates for nine inflation targeting countries to be studied in this thesis.

Table 1.1: The inflation targeting countries

	Country	Year of adoption	Target at adoption	Target at 2012	Average inflation in 2012
1	Albania	2009	3%+/-1	3%+/-1	3,4%
2	Armenia	2006	3%	4%+/-1.5	7,7%
3	Czech Republic	1997	5.5% - 6.5%	2%+/-1	1,9%
4	Georgia	2009	9%	6%	8,5%
5	Hungary	2001	7%+/-1	3%	3,9%
6	Moldova	2010	5%+/-1.5	5%+/-1.5	7,7%
7	Poland	1998	4%	2.5%+/-1	4,3%
8	Romania	2005	7.5%+/-1	3%+/-1	5,8%
9	Serbia	2006	7% - 9%	4%+/-1.5	11,1%
10	Turkey	2006	5%	5%+/-2	6,5%

Source: Central Banks, Roger (2010), for adoption dates and WEO for average inflation in 2012. Although Albania and Georgia are not included in most of the literature on inflation targeting, both central banks publish information which shows a process of inflation target performance.

1.3 Preconditions for inflation targeting adoption

The experience of countries which have adopted inflation targeting has led to the conclusion that certain preconditions have to be met in order for the regime to be successful. Among the most important ones are the following:

[2]Moldova adopted inflation target by 2010 and is included in the descriptive and analytical part of the thesis to observe the conditions in place there. However, it is not included in the empirical part, due to its few years of experience with inflation target.

Central bank objective and independence

The inflation targeting central bank's internal regulations state that the primary goal of monetary policy is price stability but sometimes, the goal of price stability is accompanied by additional objectives like employment or economic growth. A strong institutional commitment to achieve price stability as the main goal of monetary policy should be in place for inflation target adoption also because it reduces the chances of time inconsistency traps caused by political pressures (Kadioglu, Ozdemir and Yilmaz, 2000).

Institutional independence increases the chances for the framework to be successful since it ensures a full institutional support for this monetary framework (Mishkin and Schmidt-Hebbel, 2001). Even though central bank independence has been praised a lot, setting the proper relationship between the government and the central bank in the inflation targeting framework is crucial. On one had the central bank should be allowed to have complete authority in defining its monetary policy instruments. On the other hand, a commitment by the government in the process of successful implementation of inflation target is necessary to ensure cooperation between monetary and fiscal policy. It is generally believed that such a relationship exists when the target is decided jointly.

Technical infrastructure

Having in mind that inflation forecast is crucial for the inflation targeting framework, a well developed technical infrastructure should be in place, to incorporate good quality data, forecasting and modeling techniques. Proper methodology for conducting inflation forecasts should exist and qualified people to work with these methodologies should be hired or trained because human capital is very important in this process. Khan (2003) argues that the absence of the technical infrastructure can be solved by continuous training and assistance from other more experienced inflation targeting central banks.

In almost all the countries in CEE and CIS, the technical infrastructure was not in place at the time of adoption, but internal review and close collaboration with other central banks improved forecasting and modeling techniques. However, the quality of data in both regions is problematic, and it will be closely observed in the empirical section of the thesis. The case of many countries in Central and Eastern Europe is that under centrally planned regimes, the data was either inaccurate or useless due to the structural changes in the economy.

Fiscal dominance

Fiscal stability becomes an important precondition for adopting inflation targeting especially in emerging markets. In the case of fiscal dominance, the central bank is under continuous pressure to monetize the government debt, leading to money growth and high inflation. Under these conditions the goal of price stability is left aside. Blanchard (2004) explains that an increase in real interest rates can either make the government debt more attractive and cause real appreciation, or increase the probability of default and cause real depreciation. In the later situation, inflation targeting may not have the desired results since an increase in real interest rates as a result of high inflation, may cause real depreciation. Nevertheless, if the government is involved in setting the inflation target, the regime may have a positive effect in constraining fiscal policy and weakening the fiscal dominance (Mishkin, 2001).

Economic structure

For a proper control on prices stability, Batini, Kuttner and Laxton (2005) suggest that prices should be deregulated and the economy should not be excessively responsive to commodity prices and exchange rates. The administered prices can make the work of the central bank to control inflation less efficient, especially in the cases when the decision to administer prices does not take into account the supply and demand conditions (Khan, 2003).

Transparency and accountability

The central bank should communicate the objective of the monetary policy, the target inflation, and tools to be used. Generally, central banks publish regularly a Monetary Policy Report or Inflation Report which includes the objectives of the monetary policy, decisions taken by the governing body, inflation target forecasts and comments on the forecasts. Transperancy of the monetary policy abides the central bank to work hard to stay within the target since a target breach may cause a loss in credibility, crucial to the expectations management. This is a new characteristic of a monetary policy framework because in other regimes, central banks information was considered for internal use and not made public.

Healthy and developed financial system

A healthy financial system implies a stable banking system and developed

capital markets which would help keep inflation within target. Many emerging economies have put a lot of effort in the attempt to improve the conditions of the financial system.

Nowadays, it is not important if these preconditions exist in the inflation targeting countries, but to what degree they are fulfilled. Despite the fact that preconditions are mentioned in almost all studies made on inflation targeting, it has also been emphasized that inflation targeting can be adopted also when the degree of meeting these preconditions is low. Batini, Kuttner and Laxton (2005) conducted a survey among twenty one targeting countries and ten non-targeting emerging countries to address the importance of preconditions. They found out that: i) most of the inflation targeting central banks had de jure instrument independence; ii) most of the countries did not have the proper forecasting models or capabilities at the adoption of IT; iii) none of the countries had perfect economic conditions; and iv) most of them scored poorly regarding the healthiness of the financial and banking system.

1.4 The advantages and disadvantages

Scholars stand divided when it comes to the inflation targeting framework. Some of them have been supportive and emphasize the importance of inflation targeting advantages while critics have highlighted the disadvantages of the framework. Here are presented the most discussed and emphasized advantages and disadvantages of inflation targeting.

1.4.1 Advantages

The main benefits of inflation targeting are seen to be the following. First, inflation targeting provides a nominal anchor for the monetary policy and anchors expectations faster than other frameworks because it targets inflation directly not through intermediate targets. Inflation targeting central banks prepare regular forecasts of inflation for a medium term target horizon, which show the relationship between current actions of monetary policy and future goals. Published forecasts and explanations on how the central bank plans to lead inflation along these projections increase the credibility of the central bank. As a result, people's expectations on future inflation are low because they become more confident that the central banks will achieve the goal of

price stability. Also, it has been pointed out that committing to inflation target reduces the chances for discretionary monetary policy focusing for example at an unemployment target at the expense of inflation (Debelle 1997).

Second, inflation targeting offers more flexibility and operating freedom to central banks since its main focus is to achieve the medium term goal of inflation target over a specified horizon. This framework leaves room also for the application of "discretionary" monetary policy actions, allowing for some deviations in short term (Bernanke and Mishkin, 1997). This characteristic of inflation target can improve the cyclical adjustment of the economy by giving the central bank more freedom to react to demand and supply shocks (Jonsson, 1999). According to Jonsson (1999), as a reaction to an increase in inflation due to positive demand shocks, the inflation targeting framework would tighten the monetary policy to control inflation and increase the output gap. He argues that other types of policy regimes, would not achieve the same stabilization effect of these shocks, leading to increase in output and inflation volatility.

Third, the target does not need frequent adjustments under inflation targeting framework. Once the target is set, the final goal of the monetary policy is defined. King (2005) calls inflation targeting *a framework designed for a world of learning* which does not need to be changed each time some aspect of the economy changes, like it was the case with previous monetary policy frameworks.

Fourth, in case of failure, inflation targeting has lower economic costs compared to other policy frameworks. Batini, Kuttner and Laxton (2005) emphasize the idea that in case of inflation target failure, the costs are only short term and mainly experienced as temporary high inflation, slower growth, and higher interest rates. On the other hand, they explain that the cost of failure of other monetary policy frameworks are high and experienced as high reserve losses, high inflation, debt problems, and crisis.

1.4.2 Disadvantages

Despite its advantages strongly supported by the inflation target advocates, its disadvantages have been continuously repeated by critics of inflation target especially after the 2007 crisis. Two main disadvantages viewing inflation targeting as: being too rigid and offering too much discretion have been emphasized by Bernanke et al. (1999). The argument supporting the high rigidity of

inflation targeting is based on the inflation targeting delayed response to shocks by monetary policy makers. Similarly, the framework may offer too much discretion to central banks which do not score highly in terms of credibility.

Both the difficulty to control inflation and the fact that the impact of instruments on inflation is given by long and changing lags may weaken the accountability of the central bank.[3] This prevails in emerging markets where inflation is lowered from high levels and chances of forecast errors or missed targets are high. In this situation, disinflation prior to adopting inflation targeting has been recommended continuously also to avoid the fall in credibility.[4]

Inflation targeting allows for flexibility in exchange rates which may negatively affect the financial system, through their effect in domestic inflation and interest rates. Some believe that by focusing on price stability as the main goal, inflation targeting neglects the exchange rate volatility. However, Mishkin (2000) explains that emerging markets adopting inflation targeting have been careful not to allow for large movements in exchange rate which would cause negative effects in dollarized countries. Two ways have been used to limit flexibility: through putting in place an exchange rate band or through continuous interventions in the foreign exchange. Nevertheless, this process threatens that exchange rates may become the main anchor which overrules also inflation targeting.[5]

Inflation targeting is highly affected by the fiscal policy, which if translated in long-run fiscal deficits accompanied with high inflation may cause IT to fail.[6] An example of a vicious circle created by the fiscal policy is the situation where a large amount of public debt may cause for the expectation on higher future inflation making it more difficult for the central banks to achieve the target (Debelle, 1997). Also, an increase in interest rates creates a higher debt burden to the government, resulting in an increase in both interest rates and debt (Debelle, 1997). Unlike other policy frameworks, inflation targeting requires frequent assessments of the relationship between the policy instruments and inflation target, in order for the regime to succeed (Debelle and Lim, 1998).

[3]Mishkin (2000); Kadiologu, Ozdemir and Yilmaz (2000).

[4]The first industrialized countries to adopt IT underwent a process of disinflation in the years prior to adoption of IT. New Zealand experienced disinflation in four years prior to IT while in UK, disinflation started two years before the adoption. The experience of Canada is similar.

[5]Mishkin (2000) suggests that a way to solve it is for the central bank to be transparent letting the public know that it will allow for fluctuations in exchange rate over some period.

[6]See Mishkin (2000).

Moreover, to achieve the target, the central bank must be able to use a policy instrument without any constraint.

In summary, Pertursson (2005) provides four main points of skepticism regarding the implementation of the inflation targeting framework. First, the framework is considered too rigid and may not allow the central bank to focus also on other economy events, like growth or business cycles. Second, the preconditions necessary for inflation targeting are not met in all targeting economies. However, the author states that a great emphasizes should not be placed in the preconditions, since for all types of monetary policies, there are necessary preconditions. Third, central banks do not have a good control of inflation due to the transmission lags in the framework, fiscal policy, monetary policy in other countries, and different shocks. Fourth, the necessity to suppress the exchange rate fluctuations in the open economy targeters may switch the focus of the central bank from achieving price stability through inflation targeting to the exchange rate development, making the exchange rate the most important nominal anchor.

1.5 Designing inflation targeting framework

When designing the inflation target framework, both institutional framework and target framework should be taken into consideration. The institutional framework informs the public on the central bank's decision on inflation, and allows for a close monitoring of the central bank's performance. The target framework includes the process of deciding the following parameters: target level, horizon, measure and type. These parameters may vary across central banks and also across time.

1.5.1 Institutional framework

Assigning the target

The question of which institution assigns the target has been closely associated with the independence of central bank. However, the central bank independence can be classified in three types: goal, target and instrument independence. Goal independence is the freedom to set the monetary policy objectives, but is not common among central banks (Debelle and Fischer, 1994). However, there are countries in which the target is determined by the government and central bank jointly, and other countries where the target is determined either

by the government or the central bank.[7] In a survey conducted by Tuladhar (2005), it was observed that in five countries the target was set by the government, in eight countries the target was set jointly and in eight cases target was set by the central bank.[8] On the other hand, in all countries, central bank had full instrument independence to meet the targets. In the sample of targeting countries in this thesis, four central banks decide the target together with the government, and other six decide it on their own (Table 1.2).

Contrary to the idea that government intervention in assigning the target may harm the independence of the central bank, the cooperation between these institutions has positive impact on the commitment of the government to achieve the target by a supportive fiscal policy (Roger and Stone, 2005). Debelle and Fischer (1994) advocate the central bank to be goal dependent, having the government set the goals, but have instrument independence and total freedom in defining the monetary policy actions.

Inflation targeting and other goals

Under inflation targeting framework the main goal is price stability but any other goal in conform to price stability is achievable. Inflation targeting is inconsistent with fixed exchange rate regime, but consistent with employment goal and financial stability (Debelle, 1997). This inconsistency with the fixed exchange rate is straightforward since under fixed exchange rate, the monetary policy loses its autonomy and makes it difficult to target inflation. However, the goal of full employment is a desired objective of the monetary policy in the long run, but in the short run, there may exist inflation targeting policy responses which may be not be consistent with full employment.

Decision making

When designing the decision-making structure of an inflation targeting central bank, two matters should be taken into consideration (Heenan, Peter and Roger, 2006). The first issue is the degree of inclusion of the supervisory board

[7]Hammond (2012) points out that in 15 out of 27 inflation targeting countries, the target is determined by the government and central bank jointly, in 9 countries the target is set by the central bank, and in 3 countries it is set by the government. He states that among industrialized countries, only in Sweden the government is not involved in this process.

[8]In general, emerging markets are observed to enjoy more independence in determining the target, but Hammond 2012 argues that this is only de jure independence but de facto the picture is different and the government influences the decisions of the central bank. The examples of Colombia and Guatemala, the target is set by the central bank, but the Minister of Finance is a member of the decision making board.

of the bank in the process of designing and implementing monetary policy. The second issue is related to the composition of the decision making committee. The inclusion of the supervisory board shows the commitment of the board to a successful framework. Generally, a monetary policy committee is created in the central bank, taking decisions based on information available, ensuring that the decision is not centered on a single person (Roger and Stone, 2005). The composition of the committee, the frequency of meeting and the decision making system differ from bank to bank showing that there is no general rule in place (Table 1.2).

Table 1.2: Decision making in inflation targeters

Country	MPC or Board	Members		Decision making	Meetings per year
		External	Internal		
Albania	Supervisory Council	7	2	Vote	13
Armenia	Bank Board	0	7	Vote	12
Czech Republic	Bank Board	0	7	Vote	8
Georgia	Bank Board	0	12	Vote	12
Hungary	Monetary Council	4	3	Vote	12
Moldova	Council of Administration	0	3	Vote	12
Poland	Monetary Council	9	1	Vote	12
Romania	Bank Board	5	4	Vote	8
Serbia	Bank Board	0	4	Vote	12
Turkey	Monetary Policy Committee	1	6	Vote	12

Source: Hammond (2012) and Central Banks

Transparency and accountability

As already mentioned inflation targeting central banks should be accountable and transparent to the public for actions taken to achieve targeted inflation. The form of accountability changes to whether inflation is within or outside the target. In case inflation is within the target, the central bank states the inflation developments in the inflation report and explains the necessary steps to keep inflation within target level (Roger and Stone, 2005). However, in case inflation is outside the target, the central bank explains in details the reasons why the target was missed and proposes the necessary actions to bring inflation back to the target.

In addition, central banks should set a communication plan as part of the inflation targeting framework. Transparency gains more importance in inflation targeting compared to other regimes, since the public has to monitor the

central bank despite the lags between monetary policy actions and inflation results (Roger and Stone, 2005). A general convergence is observed among targeting central banks. Most of them publish the monetary policy framework, objectives, analysis on macroeconomic situations, and inflation development. Table 1.3 shows the different forms of communication and transparency level of the central banks in the study. Press releases to communicate monetary policy decisions, minutes of meeting and inflation report are common in almost all countries. However, the composition of votes is usually not made public although knowing the balance of votes is considered a good indicator for the public to know the general view of the policymakers within the board.

Table 1.3: Transparency in central banks

Country	Press release/conference	Minutes	Votes published	Inflation report (frequency)
Albania	yes	yes	no	Monetary Policy Report (quarterly)
Armenia	yes	yes	no	yes, quarterly
Czech Republic	yes	yes	unanimous, majority	yes, quarterly
Georgia	yes	yes	no	yes, quarterly
Hungary	yes	yes	yes	yes, quarterly
Moldova	yes	yes	unanimous, majority	yes quarterly
Poland	yes	yes	yes	yes, three times
Romania	yes	no	no	yes,quarterly
Serbia	yes	no	no	yes, quarterly
Turkey	yes	yes	no	yes, quarterly

Source: Hammond (2012) and Central Banks

1.5.2 Target framework

The target level

No consensus or specific rule exists regarding the level of the target. In theory, optimal level of inflation rate to ensure price stability is either zero or negative. However, in practice, positive levels of inflation rates are favored because usually the measured inflation rate is slightly higher than actual inflation; therefore a zero measured inflation rate would imply negative actual inflation.[9] More importantly, in times of financial crisis, in a environment of

[9]Svensson (1998) is more specific in defining that the quantitative target should be between 1.5 and 2.5% per year, with a band plus/minus 1 percentage point around the target. He explains also that no defined rule on how to set the instrument is required by the CB. Meanwhile Fisher (1996) recommends an average rate of annual inflation of 2% with tolerance range of±1pp.

zero inflation rates, the central bank would not be able to decrease the interest rates since this condition does not allow the real interest rate to fall below zero (Debelle, 1997). In addition, the zero inflation target suggested by the theory may cause deflationary periods which are usually more costly than inflationary periods since they negatively affect economic and financial system (Hammond, 2012).

It is advised that when deciding the target level, central banks account for some flexibility in order to respond to different short term shocks caused to the economy. Choosing between narrow and wide bandwidth seems to release information regarding the characteristics of the monetary policy. A wide band implies loose monetary policy while a narrow band would be caused by tight monetary policy and run the risk of missed targets. Generally, the developed countries have centered the inflation target on 2% (between 1% and 3%), while developing countries do not show a clear pattern of the inflation level. It is commonly accepted that developing countries have a higher target but no empirical evidence exist to support the most suitable inflation target for these countries.

Table 1.4 provides a chronology of the inflation target levels and types announced by the central banks of the inflation targeting countries under study. The general trend of emerging countries is to start by setting a high initial target and lower it continuously during a period called 'convergence period'[10], to arrive at stable medium term targets. Among the three countries which adopted inflation target first, Czech Republic, Poland and Hungary, it is observed that they first adopted a target above the low 2% level of industrial countries. The upper bounds set by Czech Republic, Poland, Hungary were 6.5%, 7.8% and 8. Similarly, Romania started from a target of 7.5%±1. Unlike the general trend observed, Turkey started with a target of 5% but by 2009 due to crisis adjusted its target to a higher rate of 7.5%. A similar path is observed for Serbia. However, the latest countries to adopt inflation target are Albania, Georgia and Moldova. Coming from a period of prior disinflation and preparation for inflation target, Albania's first medium term target was 3%±1pp. Georgia and Moldova, on the other hand, set higher medium term targets.

Target horizon

The target horizon is the necessary period for the monetary policy to ensure that the inflation returns to the preannounced target by the central bank.

[10]See Mishkin and Hebbel (2007).

Table 1.4: Development of inflation target levels

Countries/ years	Czech Republic	Poland	Hungary	Romania	Turkey	Armenia	Serbia	Albania	Georgia	Moldova
1997										
1998	5.5% - 6.5%									
1999	4% - 5%	6.4%-7.8%								
2000	3.5% - 5.5%	5.4%-6.8%								
2001	2% - 4%	6%-8%	7% ±1							
2002		5%±1	4.5% ±1							
2003	band	3%±1	3.5% ±1							
2004	(3% - 5%) -	2.5%±1	3.5% ±1							
2005	(2% - 4%)	2.5%±1	4% ±1	7.5% ±1						
2006	3.0% ±1	2.5%±1	3.5% ±1	5.0% ±1	5%	3%	7%-9%			
2007	3.0% ±1	2.5%±1	3%	4.0% ±1	4%	3%	4%-8%			
2008	3.0% ±1	2.5%±1	3%	3.8% ±1	4%	4%±1.5	2%-4%			
2009	3.0% ±1	2.5%±1	3%	3.5% ±1	7,50%	4%±1.5	8%±2	3%±1	9%	
2010	2.0% ±1	2.5%±1	3%	3.5% ±1	6,50%	4%±1.5	6%±2	3%±1	6%	5%±1
2011	2.0% ±1	2.5%±1	3%	3.0% ±1	5,50%	4%±1.5	4.5%±1.5	3%±1	6%	5%±1
2012	2.0% ±1	2.5%±1	3%	3.0% ±1	5%	4%±1.5	4%±1.5	3%±1	6%	5%±1

Source: Central Banks

Selecting an appropriate horizon is crucial since it determines the response of the monetary policy to inflationary or deflationary shocks which may cause inflation deviation from the target. Under a short horizon, inflation turns to target rather fast but at an expense of interest volatility. While a long horizon does not increase the interest rate volatility but inflation does not reach target quickly and deviation from target is more persistent. However, a short inflation targeting horizon is perceived as a signal of commitment of the central bank to achieve inflation targeting at a short time, while the long inflation target horizon signals that inflation target would take more time to be achieved. Short horizon implies higher volatility of output and financial variables compared to long horizon (Freedman and Otker-Robe, 2010).

Batini and Nelson (2000) define two ways to deal with the inflation target horizon depending on the modeling of inflation targeting framework: optimal policy horizon, when the policy is presented by a simple feedback rule on expected future inflation and optimal feedback horizon, when the policy is presented by an optimal rule for the instrument. They find out that the optimal inflation targeting horizon is medium term, implying that the central bank's response to shocks should be a gradual process and not an immediate one. The medium term target allows for some degree of flexibility and missing targets in the short term during periods of economic shocks. For economies under a process of disinflation, the horizon needs to be longer in order to increase the accountability and credibility of the central bank. Table 1.5 shows that the

target horizon in all inflation targeting countries is medium term, as suggested by literature.

Table 1.5: Target type, measure and horizon

Countries	Target set by	Target measure	Target type	Target horizon
Albania	CB	CPI	point with band	medium term
Armenia	Gov + CB	CPI	point with band	medium term
Czech Republic	CB	CPI	point with band	medium term
Georgia*	CB	CPI	point	medium term
Hungary	CB	CPI	point	medium term
Moldova	CB	CPI	point with band	medium term
Poland	CB	CPI	point with band	medium term
Romania	Gov + CB	CPI	point with band	medium term
Serbia	Gov + CB	CPI	point with band	medium term
Turkey	Gov + CB	CPI	point with band	three years

Source: : Hammond (2012) and Central Banks

*Georgia: the target set by the CB but approved by the parliament

Gov - Government; CB - Central Bank; CPI - Headline

Measure of inflation rate

Defining the inflation target measure is an important step in the inflation target framework design. A general trend in inflation targeting economies is observed towards using headline CPI, as also noticed in the sample of countries in this thesis (Table 1.5). Headline CPI was chosen over GDP deflator and core headline for the following reasons. Compared to GDP deflator, headline CPI is practical, easier to grasp by the public, and available on monthly basis. Moreover, compared to GDP deflator, it is available in shorter lags and not revised frequently.

Therefore, the choice remains between headline inflation (CPI) or core inflation (CPI without some specific commodities in the consumer basket with high volatile prices, e.g. food and energy).[11] Because core CPI is less volatile than headline CPI, many central banks decide to calculate both measures but to publish headline CPI only since it is easily understood by the public.[12] However, from the point of view of central bank, they prefer to measure core inflation to

[11]See Mishkin (2007).

[12]For the period 1997-2002, Czech Republic measured inflation by 'net inflation' which was calculated as the changes in the prices of the unregulated items in the consumer basket, accounting for changes in indirect taxes and subsidy elimination (Czech National Bank).

be able to divide inflationary signals and short term noise caused by the non-monetary shocks As a result, many central banks decide to announce headline CPI as a measure of inflation, but this is only as an operational tool in the inflation target framework, and they continuously monitor inflation through other forms apart from headline CPI.

Mishkin (2007) emphasizes the importance of a careful response of monetary policy to changes in headline inflation, since they run the risk of responding to temporary fluctuations in inflation rather than to permanent ones. His main example is that of a temporary increase in the price of energy which is naturally temporary and eventually prices will decline, keeping average inflation at the same level. If the central bank does not distinguish this as a temporary shock, it might decide to tighten its monetary policy and decrease inflation rate and unemployment. Since the monetary policy actions take time to be implemented in the real economic life, the fall in inflation and unemployment will drop them below trends. The unwanted result is considerable fluctuations in both unemployment and prices. Also in the case when the supply shock becomes permanent, headline inflation will increase until the increase in the price level of the commodity stops, and then will return to its underlying trend rate.

Type of target

Inflation target can be announced in different forms: range, point target, or point target with tolerance band. Target range allows for the target to move around a specified band and is adopted by countries which foresee doubts in hitting the target. These economies cannot have a good control of the inflation rate through inflation targeting framework and therefore allow for some accommodation of short term shocks to price level. From the sample of inflation targeting countries, the initial targets set by Czech Republic, Poland, and Serbia were range targets and the same form was kept for three to four years.

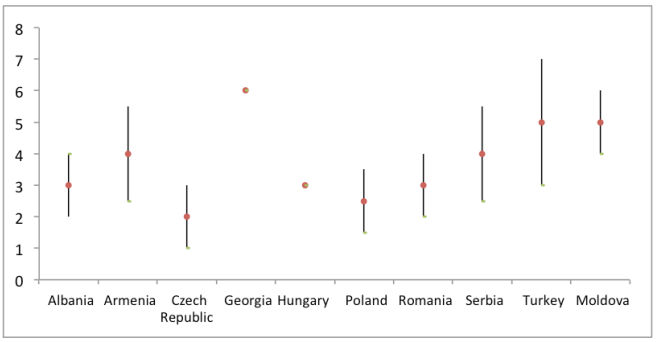
Meanwhile, point target specifies a numerical target and is mainly used by countries which want to focus their inflation expectations. Being very specific in setting the target, the central bank sends a clear message to the public regarding its goals, allowing also for a better assessment of its performance. This type of target makes sense in the medium term inflation targeting horizon, since in point targeting, missing monthly targets is common. This type of continuous inflation targeting is usually set for a period of 3-5 years and afterwards revised. An example of point target is Poland, which for the period 1999-2003

announced a target of 4 percent in medium term[13] and only in 2004 switched to point target of 2.5% with a band±1pp. Turkey, on the other hand, has issued point targets all along its experience with inflation targeting. In addition, Hungary is an example of point target 3% in the medium term, since 2005, after some period of yearly point target with tolerance band. Also, Georgia's target defined for 2012 and 2013 is set on 6% point target.

Commonly used is the point target with a tolerance band. Romania's initial inflation target announced was point target of 7.5 percent with tolerance band of±1pp and through years continued to maintain this form of target but lowered the point to 3 percent keeping the same band in 2011. Armenia started initially with point target, and moved towards point target of 4% with a tolerance band±1.5pp. On the other hand, Albania announced from the start a point target of 3% with tolerance band±1pp. Meanwhile, Czech National Bank has an experience with different forms of inflation target. Initially, it announced its inflation target as a range target from 5.5 percent to 6.5 percent in 1998, to a range between 2 and 4 percent in 2001. For the period December 2002-Decembet 2005, CNB set in April 2001 a target band of 3-5% (January 2002 was the starting target month). The band ended in December 2005, with a target level 2%-4% level. Later on, CNB changed again its target form for the period January 2006 - December 2009, to point inflation 3% with a tolerance band±1pp. Last change made was effective in January 2010, to a point target 2% with tolerance band±1pp.[14]

As of 2012, (Figure 1.1) out of ten inflation targeting countries in the sample, two use point target, while the other eight use point with band target.

Figure 1.1: Types of inflation targets in 2012



Source: Central Banks

[13]Poland also announced yearly short term targets during this period, in order to assure a transition towards the medium term target.

[14]Czech National Bank.

Chapter 2

Alternative monetary policy frameworks

Since a growing number of countries have adopted inflation targeting shows that it may be a better policy compared to the other monetary frameworks like money target, exchange rate target or some other framework with multiple objectives. In this section, the features of the two other regimes widely used before inflation target are presented and analyzed, providing a comparison of advantages and disadvantages of these regimes.

2.1 Exchange rate targeting

Exchange rate targeting is a monetary policy framework which aims to achieve exchange rate stability relative to an anchor currency via two channels: changes in interest rates and interventions in direct foreign exchange. There exist three general types of exchange rate targets: fixed exchange rate, soft peg and floating exchange rate.[1] Under fixed exchange rate, the commitment to use a foreign currency as an anchor is institutionalized in the form of a currency board, monetary union or official dollarization.[2] Soft peg is a relatively more flexible form and allows for a country to peg its currency to a foreign one either as

[1]IMF provides a more detailed classification of exchange rate regimes into the following types: exchange arrangements with no separate legal tender, currency board arrangements, conventional fixed peg arrangements, pegged exchange rates within horizontal bands, crawling pegs, exchange rates within crawling bands, managed floating with no predetermined path for the exchange rate, and independently floating.

[2]A currency board is a monetary authority bound to keep the domestic currency at a fixed exchange rate with an anchor foreign currency. Official dollarization requires the use of another country's currency as domestic currency. Monetary unions include a group of countries which decide to discard their national currencies and adopt a new one.

a crawling peg, which allows the peg to move over time, or as an exchange rate band, which allows the central bank to change exchange rates within a defined band (Fischer 2001). The most flexible form of exchange rate regime is floating exchange rates which allows for the central bank to be independent when setting monetary policy.

Exchange rate targeting is seen as the process of *importing* credibility by fixing the exchange rate of the domestic currency to the currency of a country experiencing low inflation in order to bring the inflation of the domestic country to the low levels of the anchor country, which facilitates international investment and trade. An important advantage of this framework is that it is easily understood by the public and may lead to some kind of integration (mainly economic but also political).[3]

Petursson (2000) explains three main advantages of the fixed exchange rate regime. First, by ensuring a stable currency, fixed exchange rate regime is characterized by an increase in credibility, which in a free capital flows environment is accompanied by lower transaction costs. Second, using a foreign currency as an anchor increases the transparency and credibility of the central bank, lowering inflation level. Third, fixed exchange rate regime reduces the herd behavior existent in the foreign exchange markets and has a positive impact in the economic stability.

However, the successfulness of the exchange rate target depends on two factors: on the credibility of the anchor country and the external shocks effects on the domestic currency. In this aspect, several drawbacks of this regime are observed. The loss in monetary policy independence to the anchor country is considered the main disadvantage of the regime. Under these circumstances, the central bank is not able to act in response to shocks within the country and economic shocks in the country to whose currency the home currency is pegged to. Also, as a result of the general belief that under exchange rate target, the currency risk is minimized, some room is left for un-hedged currency mismatches which are usually accompanied by financial and debt crisis (Battini, Kuttner and Laxton, 2005). In addition, the weight of achieving a successful exchange rate target falls on domestic prices which are translated as an effect on output (Battini, Kuttner and Laxton, 2005).

More importantly, a fixed exchange rate, free movement of capital and monetary independence create a trio which is inconsistent and may give rise to currency crisis (Obstfeld, 1998). The likelihood of this regime causing a crisis

[3]An example of this is the Exchange Rate Mechanism (ERM).

is higher in emerging markets due to liability structure composed of short term and denominated in foreign currency instruments while the income is received in domestic currency. Examples of a crisis due to home currency losing value in exchange rate frameworks happened in Latin America, East Asia and Russia in the 1990s.[4] Attracted by high domestic interest rates, fixed exchange rate regime, and capital mobility, a large volume of foreign investments entered these regions but at some point, this capital flow stopped, causing an increase in uncertainty, and a reversal move of the capital flow from in to out of these countries. As a result, the level of foreign reserves declined and the domestic currencies lost their values.

Analyzing the causes and impacts of the crisis of exchange rate regimes, some economists support the Bipolar View or the so-called *the two corner solution*, which argues that only the two extreme types of exchange rate systems can be considered stable: the free floating exchange rate system, and the fixed exchange rate regime. However, in the 1990s, because of the crisis, the general trend was to move away from the fixed exchange rate regimes, to more flexible ones.

2.2 Money targeting

Money targeting was first adopted in the late 1970s by developed countries like US, Canada, Switzerland, and Japan but in the 1980s and 1990s became popular in both developed and developing countries. The money targeting framework is focused on targeting the growth rate of one or more monetary aggregates as an intermediate goal to control inflation.[5] It assumes that a specific growth rate of a monetary aggregate can be achieved when the relationship between the monetary aggregates and price level is stable. The choice of which money aggregate to target is the most difficult faced by the central banks, since many central banks experience difficulties in properly managing the chosen monetary aggregates (The Czech National Bank). The regime is built on the two main assumptions that: i) the monetary base can be controlled by the central bank and ii) the velocity of the money aggregate should be stable or easily predictable in its relationship with other macroeconomic variables.

[4]Examples of countries pegging home currency to a foreign one, and going into a crisis: Mexico (1997), Asia (1997), Turkey (2001), Russia (1998), Brazil (1999), Ecuador (1999).

[5]Friedman in 1968 revisited the Quantity Theory of Money which explains the stable relationship between money supply and price level.

A positive feature of this framework is that data is easily obtainable and available in short term. Since money supply is much more easily controllable than inflation, this data becomes a good indicator of short term inflation (Batini, Kuttner and Laxton, 2005). In addition, the analysis and interpretation required by the regime on economic performance are simple and based on easy obtainable data

However, one of the drawbacks of the framework is the fact that it complicates the process of targeting inflation by using a second number money target. Since this process makes the assessment of the central bank's performance very difficult, it is argued that money targets do not work well in economies with little credibility in central banks. In addition, as mentioned above, money target is based on the assumption that money velocity is predictable, but experience has shown that targets are not always met which shattered the people's credibility in the central bank (Batini, Kuttner and Laxton, 2005). Since the parameters affecting the demand for money are usually unstable in case of financial liberalization, this intermediate target is not a good predictor of future inflation (Agenor, 2012).

Another drawback of money targeting is that it needs to be adjusted frequently due to changes in the money demand function causing changes in the relationship between money growth and inflation (Debelle and Lim, 1998). Therefore, it is generally believed that money targeting is not a good framework for emerging countries, mainly because it requires a stable relationship between money aggregate and inflation.[6] Although money target offers a nominal anchor, it failed as a result of the instable relationship between monetary aggregates and inflation.

Despite the above mentioned drawbacks, Mishkin (2002) explains that the money targeting framework is known for being successful in the case of Germany and Switzerland. However, the framework applied in these two countries is more flexible than the regular one. It includes announcing the monetary policy, aiming at the long term goals, and controlling inflation. These central banks allowed for a considerable degree of flexibility in the framework after a considerable experience with unstable relationship between monetary aggregate and inflation. Mishkin highlights that the main elements that make this kind of money target different from the usual one are, flexibility, transparency and accountability, which are also the core preconditions of the inflation targeting regime.

[6]See Estrella and Mishkin (1997).

Chapter 3

Dollarization and inflation targeting

3.1 What is dollarization

Dollarization is known as the process during which one country decides to replace (fully or partially) its own currency with a foreign currency in its main basic roles. In early literature, the dollarization process was mainly connected to the role of money as mean of exchange, and dollarization was also known as currency substitution. With time, it was observed that the foreign currency in circulation declined while the assets and liabilities held in foreign currency increased. Therefore, a new term *financial dollarization* was introduced to refer to the substitution of the store of value role of home currency, with the foreign currency (Castro, Moron, 2005).[1]

By late 1990s, after the event of Asian crisis, the new concept of *liability dollarization* was introduced to emphasize the impact of foreign currency borrowing on the exposure of developing countries to external shocks (Reinhart. et al, 2003). A more limited type of dollarization is the 'real dollarization', understood as the use of the foreign currency for price and wage contracts.[2] In the sample of countries under study, Kosovo and Montenegro moved from unofficial dollarization during a period of lack of sovereignty, to official dollarization after the formation of new states.[3] Before the dissolution of the political entity

[1]Despite the term 'dollarization', the foreign currency can be dollars or any other currency.

[2]Plata and Herrero (2007) explain that at first, literature on partial dollarization was focused mainly on the asset substitution, when the public holds foreign currency assets. After the crisis in Asia (1998) and Argentina (2002), the literature switched focus to liability substitution.

[3]They moved from using Deutche mark to Euro, without being part of the currency union.

they belonged, both Kosovo and Montenegro experienced 'complete and non endorsed loss of sovereignty' while after sovereignty was gained, they moved to 'complete and endorsed loss of sovereignty' (Minda, 2005).

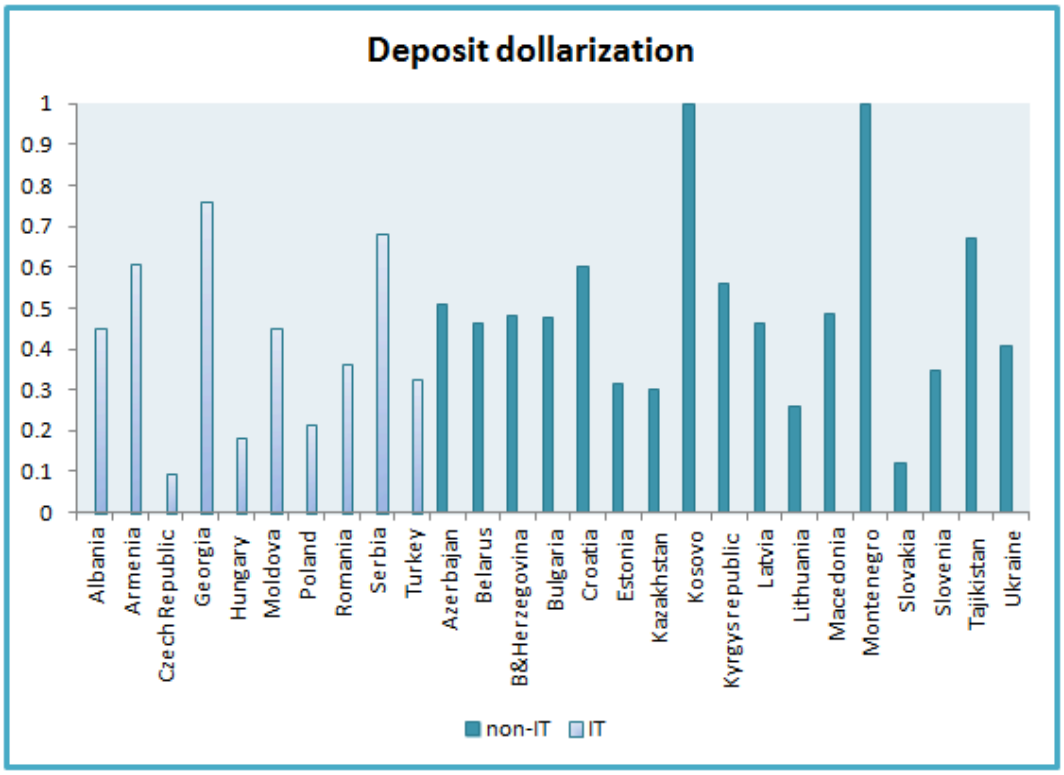
Generally, measuring dollarization is not considered easy and simple due to the lack of the necessary data to calculate the foreign currency in circulation. However asset substitution can be measured as the ratio of foreign currency deposits to total deposits or broad money, while liability substitution is measured as the ratio of foreign currency loans to total loans. It is important to emphasize that measuring dollarization for a large period in the sample of countries from both regions of Central and East Europe and the Commonwealth of Independent States, remains challenging. Reporting strategies in most of these central banks have changed many times also due to transition process from being centrally planned economies to market economies and continuous data are difficult to be found. Moreover, some of them are new states and lack data before a central bank was created there. Having in mind that deposit dollarization and loan dollarization mirror each other and one can be viewed as proxy for the other, as previously argued by Levy Yeyati (2006), the current author of this thesis calculated the deposit dollarization for the twenty nine countries in the sample, in a time span from 1997 to 2011.

Figure 3.1[4] presents the average deposit dollarization level for the period (2006-2011) for both inflation targeting and non-targeting economies in the sample. At first glance, it becomes obvious that deposit dollarization has not hit all the countries equally and the heterogeneity in the sample makes the study of inflation targeting in this group interesting. Moreover, no clear distinction in the level of deposit dollarization between inflation targeting countries and non-targeting can be made. Using a suggestion by Plata and Herrero (2007) to classify countries with low, moderate and high dollarization, it is noticed that only Czech Republic and Slovakia have a low degree of deposit dollarization of below 18%. Hungary, Poland, Lithuania, Kazakhstan, Estonia, Turkey, Slovenia, and Romania have a moderate degree of deposit dollarization under 40%, and all the remaining seventeen countries have a high degree of deposit dollarization. Among the inflation targeting countries, Georgia, Serbia and Armenia have considerably high level of dollarization, followed by Albania, Turkey and Moldova with a lower degree of deposit dollarization but still above the 40% level. A difference is viewed in the first three countries to adopt infla-

[4]Deposit dollarization calculated as the ratio of foreign currency deposits to total deposits.

tion targeting, Czech Republic, Poland and Hungary, with the lowest degree of dollarization among inflation targeters.

Figure 3.1: Average deposit dollarization 2006-2011



Source: National Banks
Kosovo and Montenegro are considered to be fully dollarized 100%

Due to the importance of the financial dollarization, it is necessary to observe its causes. One of the main sources of dollarization is the increase in globalization and openness of financial markets, which is considered positive for trade and competition. In addition, dollarization may reach high values in economies with experiences of high inflation, lost trust in home currency, currency devaluations, fiscal deficits or illegal trade (Berg and Borensztein, 2000). In the first case dollarization is considered positive, while in the second case it may be followed by instability. All these causes are clearly linked with the countries in the sample having a moderate and high degree of dollarization.

The main advantages of dollarization are considered to be: lower transaction costs and higher involvement in the international markets. On the other hand, the disadvantages of dollarization are considered loss in monetary policy autonomy and seigniorage, a need for strict fiscal policy adoption, and vulnerability of the banking system (Berg and Borensztein, 2000). More importantly,

high level of dollarization has a negative impact on the vulnerability of the financial systems, observed mainly after the crisis in Mexico, Asia, East Europe and Argentina. Dollarization increases the chances for exposure of the economies to solvency and liquidity risks (De Nicolo et al., 2003). The main source of the solvency risk is high depreciation accompanied by currency mismatches, which affects the balance sheets of banks through the loan portfolio or the open foreign exchange position (De Nicolo et al, 2003). The later is understood as the attempt of the banks to keep a balance foreign currency position by giving foreign currency loans to people whose income is denominated in local currency. Liquidity risk is the result of the inclusion of a risk premium on foreign currency deposits, as depositors have low confidence in banks supplying foreign currency liquidity when needed. In case the banks decide to supply local currency in exchange for the foreign one, the floating exchange rate regime would bring considerable loss to depositors under currency depreciation.[5]

3.2 The implication of dollarization in monetary policy

The increase presence of a foreign currency, taking over part of the roles played by the domestic currency, is bound to affect the monetary policy. It is argued that dollarization makes the process of setting a monetary policy target more difficulty, since policy makers should be careful to properly include the foreign currency element in their analysis and decision making. As a result of low costs to switch from domestic to foreign currency in the face of high inflation, dollarization may cause an increase in the volatility of money demand and the volatility of exchange rate (Plata and Herrero, 2007). The literature has not been able to provide a full picture of the effects of dollarization on monetary policy. However, here are presented some of the results of several studies on the impact of dollarization on inflation, output, and exchange rate pass through.

The relationship between dollarization and inflation is not clear to define. Emerging economies experienced increase in dollarization level especially during periods of hyperinflation and economic instability, when the public lost trust in the domestic currency but even after inflation was lowered, dollarization did not decrease in these countries (Plata and Herrero, 2007). Figure 3.2 shows the deposit dollarization and inflation development in the inflation targeting

[5]See De Nicolo (2003).

countries in the sample for the period 1997-2011. Despite achieving low levels of inflation, the level of dollarization did not decrease. Following this line, it is difficult to argue that dollarization has become an obstacle on the process of achieving stable prices, since inflation has lowered in all these dollarized countries.

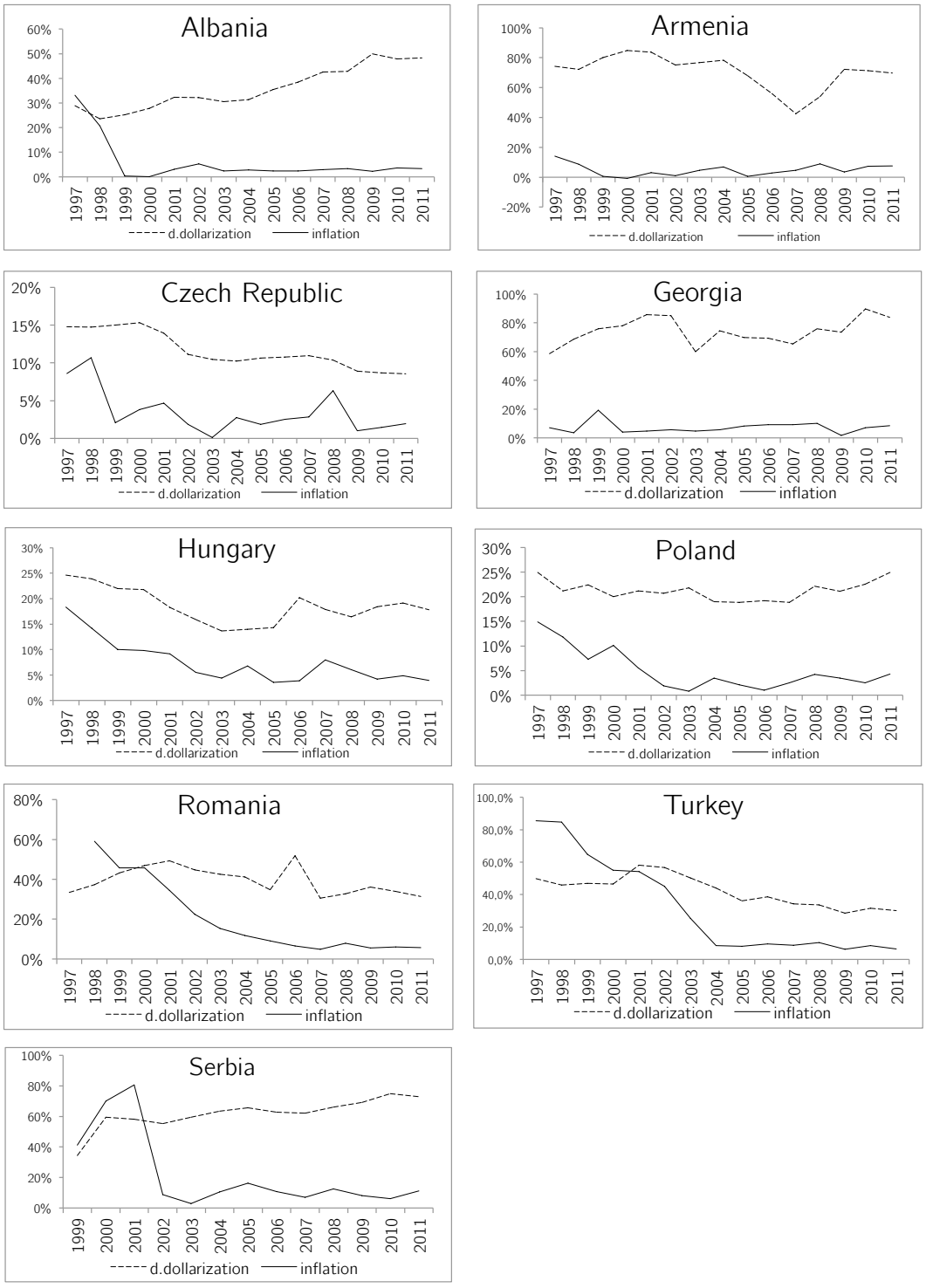
The persistence of the financial dollarization even when inflation is lowered is explained by Ize and Levy Yeyati (1998) by the fact that exchange rate volatility may have decreased at least as much as the volatility of inflation and may be characterized as fear of floating. Another cause for persistence has been pointed out to be the decrease in credibility on the monetary regime, and fear of expected high inflation. A classic example is the hard peg, under which the choice of people to hold foreign currency deposits depends on their expectations of how will monetary policy be administered in case of a collapse, despite the low chances of this happening (De Nicolo et al, 2003). It is important to highlight that the degree of dollarization did not have any effect neither on the duration of the disinflation period nor on the output growth performance of the economies (Reinhart et al, 2003).

Chances of debt defaults combined with moral hazard may result in high dollarization, under the condition that both borrowers and lenders believe that the government will bail them out in case of a large depreciation, and do not account for the risks of foreign currency borrowing (Nicolo et. al, 2003). Thus, the commitment to stable exchange rate becomes a necessity for the monetary policy in dollarized countries.

Evaluating the impact of dollarization through an exchange rate shock to inflation, in order to assess the relevance to monetary policy, Plata and Herrero (2007) conclude that the price increase is much smaller on moderately dollarized countries compared to highly dollarized ones. Also, countries with a high degree of dollarization experience high and significant exchange rate pass-through compared to low dollarized countries.

Ize and Levy Yeyati (2003) state that balance sheet effects affect the banking sector and may lead to bankruptcy. The local banks are financed by foreign currency deposits or borrowing and due to several rules finance the foreign currency as loans to individual borrowers whose income is denominated in local currency. In case of exchange rate depreciation, this currency mismatch becomes dangerous because the value of foreign currency liabilities increases, and the chances of loans not to be repaid are higher. This situation led to the crisis in Turkey (2000), Brazil (1999), and Argentina (2002). Chances of debt

Figure 3.2: Dollarization and inflation



Source: Central Banks and World Ecoonomic Outlook

defaults combined with moral hazard may result in high dollarization, under the condition that both borrowers and lenders believe that the government will bail them out in case of a large depreciation, and do not account for the risks of foreign currency borrowing (Nicolo et. al, 2003). Thus, the commitment to stable exchange rate becomes a necessity for the monetary policy in dollarized countries.

Two main difficulties created by dollarization are the following (Leiderman et al, 2006). First, since the balance sheets of the companies in dollarized economies are composed of debts in foreign currencies, while their receipts are in local currency, the balance sheets become exposed to the changes in nominal and real exchange rates that happen under inflation targeting. Secondly, in dollarized economies, the exchange rate may have a higher pass-through to prices and the balance sheet effect would cause for devaluations. This is contrary to the standard transmission mechanism, which implies that a depreciation of real exchange rates would have a positive impact on output.[6]

In literature, the 'fear of floating' is generally associated with dollarization, implying that economies are more vulnerable to exchange rate volatility fearing that changes in exchange rate may negatively affect balance sheets and output (Reinhart.et. al, 2003). This reaction has clear implication in the conduct of monetary policy, but does not imply that monetary policy becomes inefficient in achieving price stability. Answering the question whether dollarization should be discouraged or not, Balino et al, (1999) explain that it depends on the role that dollarization plays in the economy. If it comes as a result of the globalization and openness of the financial markets, it should be welcomed. However, if caused as a result of macroeconomic instability and weak financial markets, dollarization may further complicate the situation as a result of measures taken to strengthen the domestic currency.

3.3 Inflation target and dollarization

When implementing inflation targeting in dollarized countries, a specific focus on the monetary policy analysis should be given to the relationship of dollarization and the ultimate target. As pointed out in Mishkin (2000), dollarization may create problems to a successful implementation of inflation targeting especially in emerging markets. Mishkin (2000) argues that since inflation targeting

[6]Argument made by Leiderman et al 2006.

allows for flexible exchange rate, any depreciation may decrease the value of balance sheets for firms, households and banks, increase the weight of foreign currency denominated debt, and create problems for the financial markets pushing them towards crisis.

However, other studies have a positive outlook regarding the suitability of inflation targeting regime in a dollarized economy. Ize and Levy-Yeyati (2003)'s findings show that fully fledged inflation targeting, which allows free floating exchange rates within the confines set by the target, would lower financial dollarization by increasing the attractiveness of the domestic currency relative to the foreign one. However, they highlight the idea that unless both price and wages denominated in foreign currency, and the pass through of exchange rate are at moderate levels, the scope of keeping low inflation and volatile exchange rates (under inflation targeting) would not have an impact in decreasing financial dollarization.

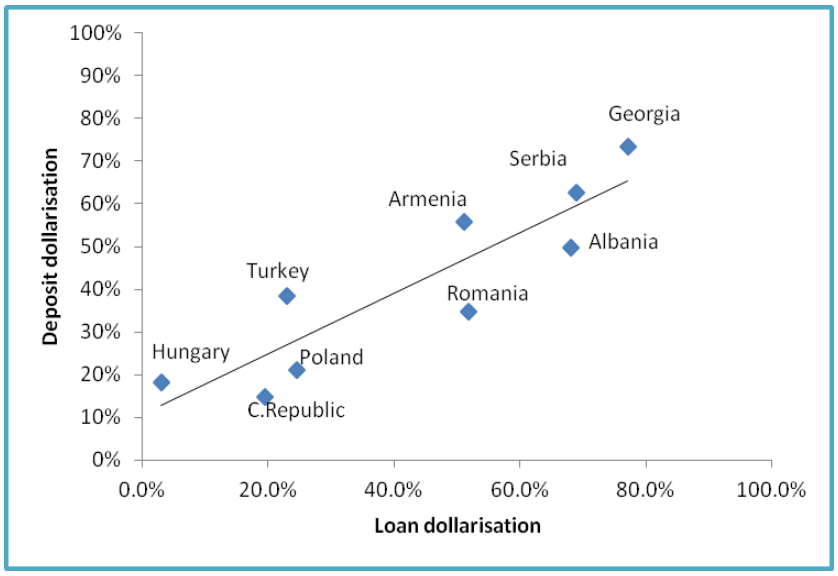
De Nicolo et al (2003) explain that the best monetary policy regime in dollarized economies would be to target inflation directly and allow free floating. The authors recommend that this process should be gradual, to limit at first the fluctuations in the exchange rate in order to allow for strengthening the credibility. They believe that inflation targeting is accompanied by a decrease in the level of dollarization, but argue that continuous reforms are needed for de-dollarization and strengthening of the domestic currency. Moreoever, trying to assess whether inflation target can be achieved in a dollarized economy, Batini, Levine and Pearlman (2008) arrives at three important conclusions. First, the conduct of monetary policy in a dollarized economy can become more challenging, but it can be successful at low cost, in case of an inflation targeting central bank. Second, smoothing the exchange rate is important even when the degree of dollarization is defined endogenously by the monetary policy reaction to exchange rate. Also, it is pointed out the fact that countries with credibility problems may benefit from partial dollarization, since it forces the monetary policy to be stricter. Third, the recommended exchange rate smoothing lowers the probability for multiple equilibria.

However, the design and adoption of inflation targeting regime in a dollarized economy has to have different characteristics from the non-dollarized ones (Armas and Grippa, 2005).[7] The differences lie in the target, forecasting process and the way the central bank manages the risks coming from dollariza-

[7]Their study focuses on the Peruvian case, since Peru was a highly dollarized economy at the time of IT adoption.

tion. Nevertheless, no clear requirement regarding the level of dollarization at adoption has been observed until now. Figure 3.3 shows the inflation targeting countries in the sample and the levels of both deposit and loan dollarization at year of adoption. However, some kind of symmetry between loan and deposit dollarization is noticeable, but every country had different level of both deposit and loan dollarization at the year of adoption. The spread of countries along the line from low to high levels of dollarization shows that no clear rule or trend is observed regarding the proper degree of dollarization at adoption.

Figure 3.3: Loan and deposit dollarization at adoption



Source: Central banks

Chapter 4

Inflation targeting countries

Before performing an empirical study on the inflation targeting countries in the sample, it is necessary to briefly highlight the rationale for adoption and the reasons why the previous regimes failed. Further, this section presents also a general inflation and GDP performance and a target performance in each country.

4.1 Rationale for IT adoption

Albania

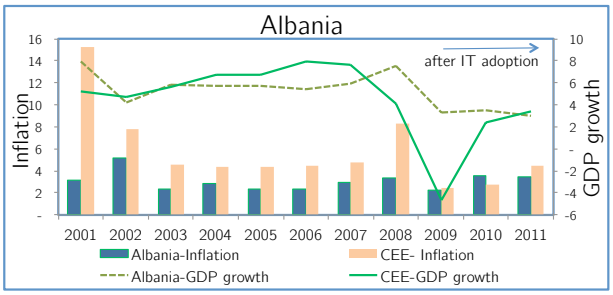
Emerging from a closed communist regime, Albania experienced an increase in inflation in early 90s, which was brought down to one digit levels by a monetary aggregate regime by mid-90s. Albania decided to switch to inflation targeting framework for the following three reasons. First, having achieved price stability with the help of monetary policy framework, Albania was facing a situation defined by Estrella and Mishkin (1997) as a low inflation environment where the monetary aggregates fail to communicate information due to increased noise in velocity shocks (Luci, 2007). In this respect, inflation targeting seemed an appropriate substitute. Second, it was deemed necessary by the central bank to replace the IMF program targets with a nominal anchor like inflation targeting.[1] Third, inflation targeting was viewed by the central bank as a complex regime which would increase incentives for all the economic players, making the government aware that the success of the regime depended on its commitment also.

Albania adopted inflation targeting in 2009, but its preparations for the

[1] Fullani (2008).

new framework started in 2004 by improving the institutional structure and analytical resources. Several forums were organized during this period with the participation and feedback from representatives of targeting central banks. Average inflation reached one digit levels in 1995 but increased sharply again during the pyramid schemes in 1997.

After a stabilization program put in place, inflation fell again. Since 2001, average inflation was around the target value of 3% while unlike other countries, economic growth during the crisis fell less than the region.



Inflation and GDP growth performance

Armenia

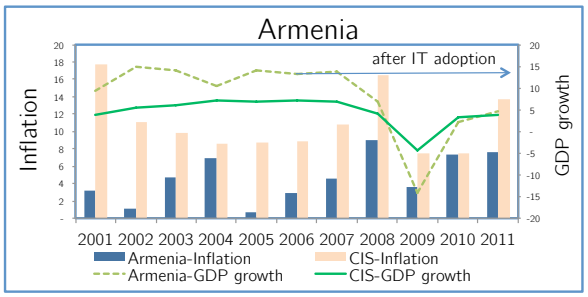
One of the reasons, the Central Bank of Armenia moved away from money targeting was the high dollarization of the economy. Due to continuous changes in the structure of credit, deposits and broad money, the demand for money became unpredictable, making it difficult for the central bank to work with its monetary regime.

Faced with missed targets and damaged credibility, the central bank decided to choose between inflation targeting and exchange rate targeting. The later was not considered appropriate because its two main objectives, lower inflation and economic integration, were not relevant to the Armenian case (Central Bank of Armenia). By 1998 Armenia was already experiencing low inflation but achieving economic integration was complicated because it was not clear whether Dram should be fixed to US dollar (since main financial inflows were denominated in US dollar), or to Euro (since the trading was done with EU countries). In both cases, the country would be vulnerable to shocks. Therefore, the Central Bank of Armenia started in January 2006 a transition period to fully-fledged inflation targeting, by making public only the central bank's actions. Like Albania, Armenia achieved macroeconomic steadiness prior to the adoption of inflation targeting, making the regime attractive for its ability to anchor expectations and not for the need to disinflate.

In early 90's Armenia experienced considerably high level of inflation, but reached single digit levels by 1998. In early 2000, average inflation was considerably lower than the Commonwealth of Independent States, but a rapid

increase in 2008 narrowed the gap.

Further, the economic growth in Armenia was higher than the average CIS economic growth from 2001 to 2008. The effects of the financial crisis are observed in 2009 when the growth decreased drastically below the average of the region.



Inflation and GDP growth performance

Czech Republic

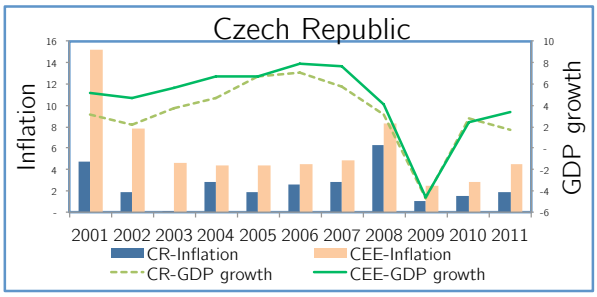
With the economic stabilization package in 1991, Czech Republic introduced the fixed exchange rate regime, which lowered inflation but not at the levels of advanced economies. The Czech Koruna depreciated a little compared to the other countries mainly due to the lower level of dollarization.[2] After abandoning the fixed exchange rate regime in 1997 due to currency problems, inflation rates increased in Czech Republic.

In December 1997, Czech National Bank adopted inflation targeting, becoming the first transition country to adopt the new regime. This decision was taken after a six month period of evaluating four options of monetary policies: 1) introduce fixed exchange rate; 2) introduce money targeting;[3] 3) adopt a 'just do it' approach similar to FED; and 4) adopt inflation targeting (Smidkova, 2008). The 'just do it approach' and 'fixed exchange rate' were not applicable in this case, since the former would not allow central bank to anchor inflation expectations and convince the public that inflation would decline, while the later would imply for the country to lose independence in conducting the monetary policy (Jonas and Mishkin, 2004). On the other hand, money targeting was not suitable due to the unstable capital inflows and the inability to forecast the relation between monetary aggregates and inflation.

[2]See Jonas and Mishkin (2004).

[3]Both fixed exchange rate and monetary targeting had been used before by the Czech National Bank.

The average inflation rate in Czech Republic before IT in 1996-1997 was 8.7%, while in the past decade (2001-2011), it fell to 2.5%. In terms of GDP growth, a continuous increase is observed after adoption moving from 1.8% in 1996-1997 to 3.3% in 2000-2011.



Inflation and GDP growth performance

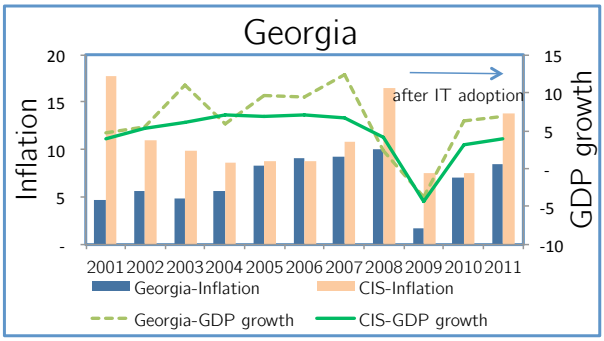
However, similar to Central and East European countries, Czech Republic was affected by the crisis in 2009, but started a continous recover afterwards.

Georgia

After the "Organic Law of Georgia on the National Bank of Georgia" was put in place in 1995, the central bank had two main objectives of price and exchange rate stability which were inconsistent with each other (Bakradze and Billmeier, 2007). The high degree of dollarization and under-developed financial markets, made the focus of the central bank to keep stable exchange rates, leaving the price stability objective aside. By 2004, the effort to keep stable exchange rate caused a volatile liquidity situation and increased capital inflows (Bakradze and Billmeier, 2007).

During 1999-2003, exchange rate fluctuations caused for a depreciation of the domestic currency. Despite the several failed attempts taken by the National Bank of Georgia to stabilize the situation, it was decided to start a gradual process of moving toward inflation targeting which was publicly announced in 2009.

Prior to year 2004, average inflation in Georgia was relatively lower than the average inflation in Commonwealth of Independent States, however after the problems faced in 2003-2005, inflation almost doubled.



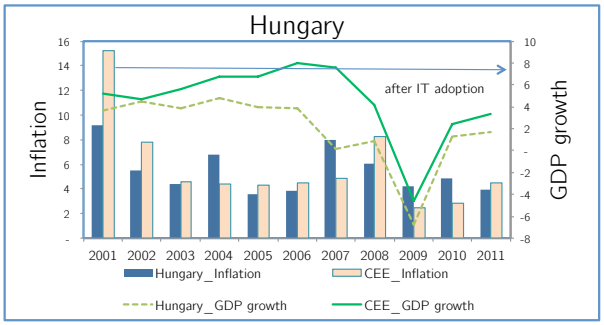
Inflation and GDP growth performance

Further, the GDP growth was higher than the region but heavily affected by the crisis in 2009.

Hungary

Unlike other countries like Czech Republic and Poland which adopted floating exchange rates by late 1990's, Hungary decided by May 2001, to widen the band within which the currency fluctuates to 15% (up or down) from the historical 2.25% used since the adoption of the exchange rate regime in 1995 (Jones and Mishkin, 2004). By 2000, it became obvious to the National Bank of Hungary that the disinflation process had stopped. Therefore, to increase the independence level of the bank in the conduct of monetary policy, it decided to widen the band. The widening of the fluctuations band was seen as a gradual transition step of the economy to inflation targeting. This transition was characterized by a decline in the level of inflation and anchored inflation expectations. By August 2001, the National Bank of Hungary announced the end of the exchange rate regime and around the same time restrictions on capital flow were removed. After a decade of economic stability, Hungary moved to inflation targeting in December 2001. Average inflation during 1993-2000 reached the value 18.1% and was characterized by continuous decline.

In the past decade this value fell to 5.5% and except for year 2004 and 2007, remained below the CEE average inflation. Also, the economic growth of the country was below the growth of the region, and the decline in 2009 due to the crisis was sharper.



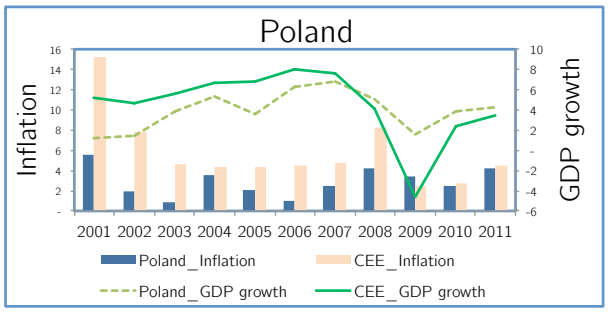
Inflation and GDP growth performance

Poland

Since 1990, the National Bank of Poland switched from fixed exchange rate to crawling peg in a period of eight years. Initially, fixed exchange rates, combined with price liberalization and no control on prices, pushed the prices up in the early 1990s (Horska 2001). Reacting to a real appreciation of the domestic currency, NBP moved to crawling peg with a band which was widened over the years to allow for a gradual decrease in inflation rates from 44.4% (end of the year) in 1992 to 9.8% (end of the year) in 1999, when inflation targeting was adopted. Inflation targeting seemed attractive and suitable to the Polish economy with developing financial markets and increasing openness, because the existing monetary policy regime was facing the following three challenges:

shocks from the anchor country, difficulty in communicating signals by National Bank to the economy due to the abundant liquidity in banking and irregular capital inflows (Horska 2001). In the past decade, Poland's average inflation was below the CEE average inflation, but the gap seems minimal in the last two years.

An increase in average inflation and decrease in economic growth was observed in 2009. Although the economic growth rate before the crisis was below the region, during the crisis, Poland experienced a lower decline in economic growth.



Inflation and GDP growth performance

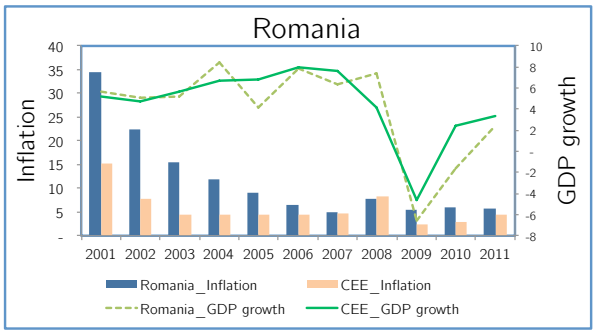
Romania

In early 1990s Romanian economy was characterized by high inflation and a monetary policy trading the necessary goal of price stability to focus more on seigniorage, the important source of financing government expenditures (Daianu 2008). Despite several objectives of the monetary policy followed by the central bank to lower inflation, single digits level of inflation was achieved only by 2004, moving from a level of 295% (end of year) in 1993 to 30% in 2001. Money target was adopted as a monetary anchor since exchange rate framework was not considered suitable due to unstable relationship between inflation and interest rates (Daianu 2008). Since money targeting failed to achieve price stability, NBR decided to adopt inflation targeting in 2005 after some transitioning time used to undertake some institutional reforms necessary for inflation target like: bringing inflation down to single digit, achieving full operational independence, improved financial system, successful disinflation and improvements in demining the fiscal dominance.[4]

For the period 1996-2003, inflation averaged 50.7% which decreased drastically in the period 2004-2011 to 6.5%.

[4]Speech by the governor.

For almost all the phase between 2001 and 2011, average inflation in Romania was above the average level in CEE countries, but the gap between them narrowed down considerably by 2007 and increased again after the crisis in 2009.



Inflation and GDP growth performance

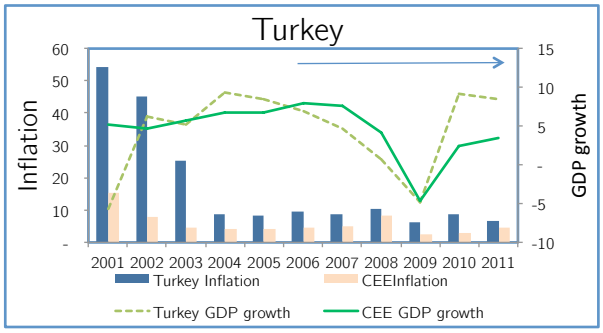
Apparently economic growth peaked in 2004, to fall drastically in 2009, and gain momentum by 2011.

Turkey

In 2000, Turkey adopted a crawling exchange peg, which temporarily managed to lower the level of inflation and interest rate, increasing people's credibility in the Central Bank. However, the positive outcomes did not last and the exchange rate target led to the February 2001 crisis which was accompanied by depreciation of the home currency, an annual inflation rate of 68% by 2001, a considerably high level of dollarization, high fiscal dominance and increase in public debt. Prior to the crisis, the increase need for public sector borrowing was becoming a burden on the domestic financing, rather than on inflation tax, which insured inflation levels not to increase (Ersel and Ozatay, 2008).

This situation later on caused for an boost in price and real interest rates, pushing inflation rates up. Taking into consideration the inapplicability of monetary targeting and the actual fiscal dominance in the economy, Central Bank of Turkey announced in May 2001 that it would start a new stabilization program, implying the implementation of implicit inflation targeting with very few preconditions in place (Ersel and Ozatay, 2008).

For the period 1994-2002, inflation rate averaged 68.7% but decreased drastically to 8.4% for the time between 2004 and 2011. Until 2007, average inflation in Turkey remains at higher levels than CEE region, but the gap narrows after 2004.



Inflation and GDP growth performance

Economic growth increased from 2001, with slight changes, to start decline

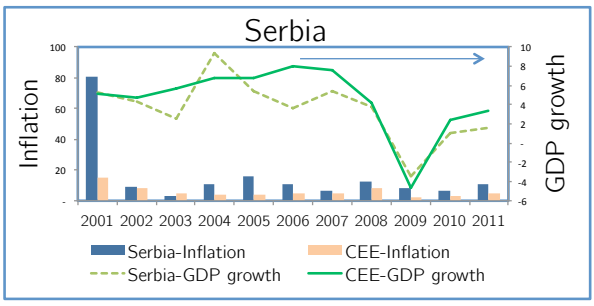
and reach bottom by 2009 following the same pattern as the group of CEE countries.

Serbia

Serbia switched to inflation targeting in 2006, having the following goals in mind: reach low and stable inflation, strengthen the domestic currency and increase its credibility, improve the monetary policy reactions to both domestic and foreign shocks, and make the proper economic changes in compliance with the EU accession requirements (National Bank of Serbia).

On its agreement to inflation target, the National Bank of Serbia states that inflation targeting was adopted to properly react to the effect that future structural changes in the country will have in prices and also for the negative impact that the high degree of dollarization would have in the transmission mechanism of inflation. In that situation, the NBS argued that neither fixed exchange rate, nor money target would ensure prices stability better than inflation targeting. Therefore, the goal of the bank was to build an environment characterized by low and stable inflation, where it is more profitable to save in the domestic currency, and the public is well aware of the exchange rate risk that may affect their savings and investments in foreign currency.

For the period 1998-2001, inflation averaged 55.4%, and managed to reach single digits inflation rate by 2002, which was short, lived. For the period 2002-20011, average inflation was 9.4%, remaining during 2001-2011 period, well above the CEE average inflation.



Inflation and GDP growth performance

Similar to other countries, economic growth experienced a decline in 2009.

4.2 Target performance

Missing targets

Experience has shown that inflation usually deviates from targets beyond the margins set sometimes for prolonged periods and other times frequently. Evidence confirms that economies with stable inflation miss the targets 30% of the times, while countries in a process of disinflation miss the targets 60% of the times (Roger, 2005). The largest deviations from the targets are associated with volatile exchange rate situations but usually detailed explanations on the reasons for deviations are explained the Inflation Report or the Monetary Policy Reports. Despite the deviations, no country has yet abandoned the framework because of the deviations. The most common reaction by central bank to missed targets is the adjustment of targets.

The causes for the target misses vary across country and time. Studying the largest misses in a group of inflation targeting countries Roger and Stone (2005) explain that the causes lay both in domestic and external shocks. Domestic shocks are observed in the form of alterations in monetary and fiscal policies, food supply, and some events specific to each country. External shocks are observed as changes in capital inflows due to alteration of investors' risk sensitivity and changes in fuel prices.

Mishkin and Hebbel (2007) try to assess and compare the degree of the achievement of the targeting central banks in hitting the targets with the success of non-targeting central banks in keeping inflation around inflation trends. At first look, it seemed that inflation targeters performed worse in terms of larger deviations from the target compared to the non targeters. However, when controlling for both country and time fixed effects and came to the conclusion that when comparing the whole group of countries, it was observed that inflation deviations were smaller for targeting economies compared to non-targeting.[5]

Figure 4.1 presents the actual annual inflation in relation to the target inflation in the nine inflation targeting countries in the sample.[6] Different results are observed across countries. Among the first countries to adopt the framework Czech Republic and Poland, experienced inflation rates mainly within the target but with continuous periods of undershooting the target. Hungary

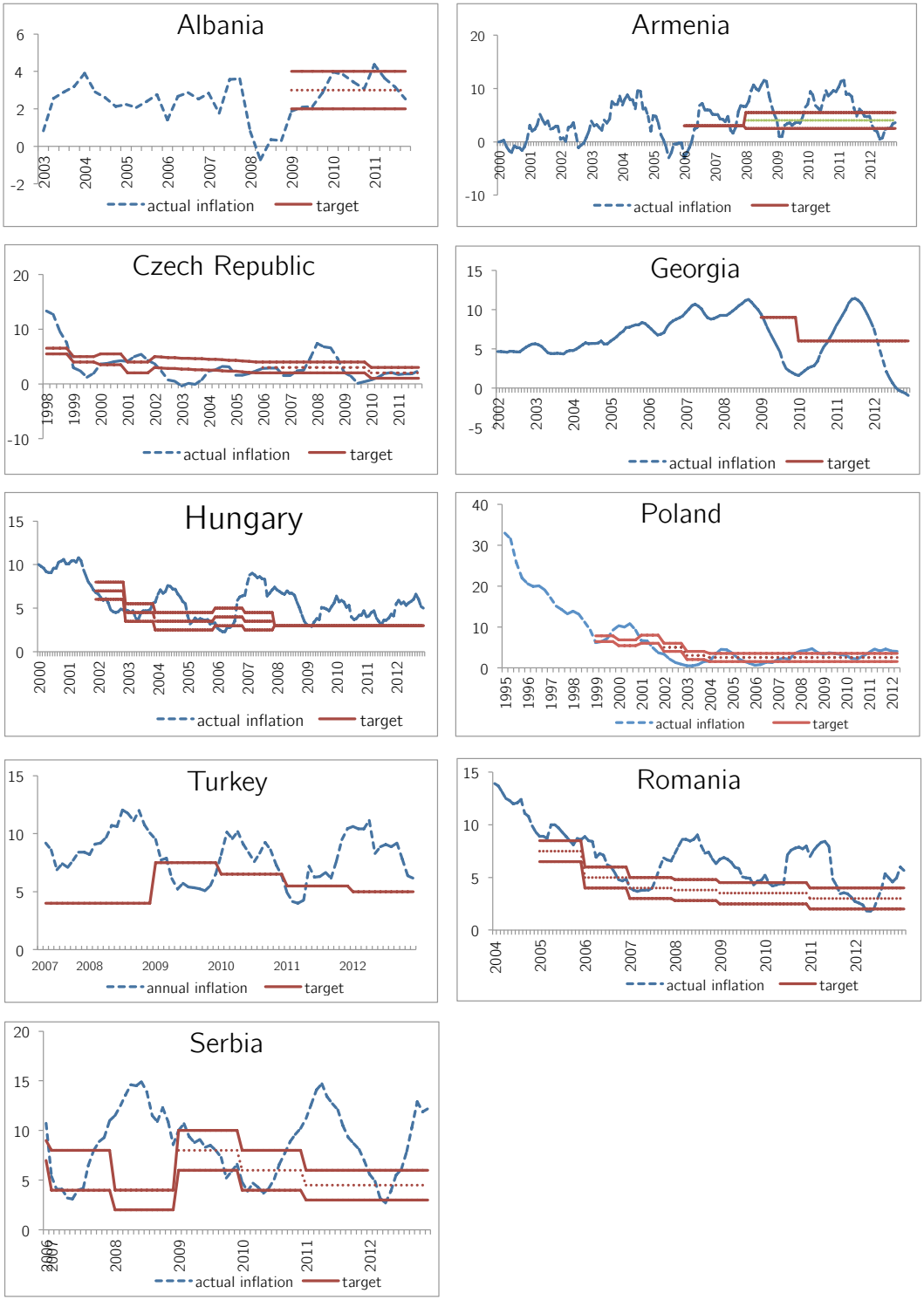
[5]The authors point out that after changing the control group to include only non targeting countries, the results are no longer statistically significant.

[6]Annual inflation is presented either in monthly or quarterly data, to better observe the fluctuations.

experienced frequent fluctuations in inflation around the target, which central banks considers acceptable if they stay within the ±1 pp band. Turkey, Armenia, and Serbia show frequent fluctuations of inflation target, mostly overshooting it. Romania set its initial target during a period of disinflation, and continued to lower the target for a couple of years, during with the deviations were not large. However, the impact of the crisis is observer in 2008 when inflation rates rise again but as a result of actions of central bank, inflation is brought back to the target level. Albania adopted inflation targeting after achieving stable inflation and for the period of inflation targeting framework 2009-2011, the inflation level is observed within the band set by the central bank. On the other hand, Georgia set the initial target at the start of a disinflation period, which encouraged the central bank to declare a lower revised target a year later. Following this action, inflation overshot in late 2010, but fell back again in 2012.

In many cases inflation levels fall below the target, like the experience with Poland in 2001 and Czech Republic during 1998-1999. The lower bound of the inflation target has been treated differently by central banks. For some central banks, the lower bound is similar to the upper one, and necessary measures are taken once inflations falls below it, while some other central banks decided to strengthen the unexpected disinflationary period (Jonas and Mishkin, 2004). Poland is an example of the later case, as it decided to adjust its initial target of 1999 after the unexpected fall in inflation. Jonas and Mishkin (2004) mention three reasons why this *opportunistic reaction* towards disinflation is bad: 1) it will not be easily accepted by the politicians, as it may be accompanied by a weaker economy and the need for a more relaxed monetary regime, which leads to higher inflation; 2) the disinflation may occur due to temporary shocks, and a response of the monetary policy is not recommended; 3) it could harm the credibility of the inflation targeting regime, as the medium target announced by the central bank aims to announce some predictions of the economic situation and allow people to adjust their expectations and act accordingly.

Figure 4.1: Actual inflation and inflation target[7]



Source: National Statistics Offices

[7]Different periods are presented for different countries, in order to pay a closer look to the inflation targeting period. For example, a longer period is graphed for the Czech Republic, compared to Turkey

Chapter 5

Literature review on inflation target impact

Many empirical studies have been conducted providing different results on the impact of inflation targeting in the performance of the targeting economies. The literature is mainly divided by its focus of countries under study, on industrial and emerging countries. It is common that some of these studies are conducted on similar data and period sample, but using different methodologies to confirm or reject results from previous studies. The results are robust to country sample, time sample and methodology used but different results are obtained also because of the different impact of inflation targeting across economies. Despite the fact that the countries studied in this thesis are considered emerging economies, for the purpose of a clear understanding of the literature on inflation targeting, below are presented some results of studies on both industrial and emerging countries

5.1 Empirical results from industrial economies

The first studies to be conducted on inflation targeting were focused on industrial countries. A series of them were performed on the quest to answer the question 'Does inflation target matter?'. Neumann and Von Hagen (2001) analyze nine industrial countries, six of which inflation targeters, for the period 1978-2001 to observe: 1) the effect of inflation targeting on inflation volatility, output gaps and interest rates; and 2) policy reactions to both inflation and large supply shocks. The results are positive and significant in terms of lower inflation and restrained volatility of inflation and interest rates. Also, an im-

portant observation is the increase in credibility of the countries' central banks which used to be high inflation economies. Similar positive results are observed by Johnson (2002)[1] in an analysis on five industrial countries. He concludes that after the adoption of inflation targeting the expected level of inflation fell considerably by 1 to 2 percentage points in most of the years. Nevertheless, he points out that the level of inflation fell both in targeting and non targeting countries.

Later on, Ball and Sheridan (2005) provide a critical approach to inflation targeting. In their study of twenty OECD countries (seven targeters and thirteen non-targeters), they find out that inflation targeting does not bring positive outcomes on inflation, output and interest rates. They argue that if one controls for the reversion to the mean, there is no evidence that inflation targeting improves economic performance of an economy. The reversion to the mean is explained by the fact that countries which experienced high inflation prior to the 1990s, dis-inflated at a higher degree compared to countries with low inflation rates. However, they explain that their study does not provide any evidence that inflation targeting has been harmful to the countries adopting it. In conclusion, authors suggest also that inflation targeting may cause two benefits which they do not measure. First, inflation targeting may have more positive social effects than economic ones.[2] Second, inflation targeting may improve economic performance in the future and similar studies may provide evidence of better performance due to inflation target.

Using the same difference in difference method, Hyvonen (2004) argues against the argument made by Ball and Sheridan (2005) that the inflation convergence was just a property of cross country performance of inflation. His empirical study is focused on the same twenty countries of Ball and Sheridan (2005) for an extended period 1961-1992 to check the results of the previous study on a different time period. Observing the average inflation across countries during periods that countries switched from one monetary policy framework to another, convergence across countries which followed the same monetary policy framework was observed. Hyvonen (2004) concludes that at least partially, inflation targeting has influenced the convergence of inflation rates during that period.

[1]Neumann and Von Hagen use Taylor rule and VAR analysis, while Johnson (2002) uses panel data analysis.

[2]They explain that this view is consistent with Bernanke et al. idea that IT creates room for open policymaking, allowing the central bank to act in accordance with principles of a democratic society.

Meanwhile, following panel estimations, Wu (2004) also observes that in a group of twenty two OECD countries, inflation targeters experienced lower average inflation rates and no evidence was found to support the idea that this change is only due to the reversion to the mean. Moreover, despite the general belief that the inflation targeting regime is conducted at the expense of a more aggressive monetary policy in terms of real interest rates, Wu (2004) finds no significant change in the real interest rates in the inflation targeting countries.

In addition, Lin and Ye (2007) study the impact of inflation targeting in seven industrial countries by using a propensity score matching method. They found out that the average treatment effects of inflation targeting on inflation level and inflation volatility are small and insignificant. Similarly, the effects on long term nominal interest rates and income velocity of money are insignificant. However, using similar data as Lin and Ye (2007) on a dynamic panel analysis, Brito (2011) finds out that inflation targeters has positive effects both in terms of inflation level (a fall of 1.4 percentage points in inflation targeters) and GDP growth.

5.2 Empirical results from emerging markets

Although empirical studies focusing only on emerging countries are fewer compared to studies focusing on industrial or emerging and industrial countries, they are important since they show more positive results of the impact of inflation targeting. Gonçalves and Salles' (2008) empirical study focuses on thirty six emerging economies, out of which thirteen adopted inflation targeting. They conclude that inflation targeters experience a larger decrease in average inflation and lower output growth volatility compared to the non targeters, even after accounting for the reversion to the mean. Meanwhile, the effects of inflation target on inflation volatility have the expected negative sign but are not significant. Batini, Kuttner and Laxton (2005) also conduct a similar study of forty two emerging market countries, out of which thirteen being inflation targeters. The results show that average inflation rate fell by 4.8 percentage points more in targeting countries, while inflation volatility fell by 3.6 percentage points more. Moreover, they highlight the fact that the decline in average inflation is not achieved at the expense of output growth.

Interesting results are presented by Lin and Ye (2009)[3] who continued their

[3]Ball and Sheridan (2005), Hyvonen (2004), Gonçalves and Salles (2008) and Batini,

2007 study on developed countries, with another study on fifty two developing countries, out of which thirteen being inflation targeters. Contrary to their results on developed countries, they found out that inflation targeting has a considerable and significant effect in lowering inflation by almost 3 percentage points in developing countries. The results for both studies were obtained by using the same methodology on different country sample and period sample.

5.3 Empirical results from industrial and emerging countries

Studies including both industrial and emerging economies provide a variety of different results. Fraga, Goldfajn and Minella (2004) find out that while average inflation has fallen in both developed and emerging economies, the latter have recorded a worse performance. Likewise, volatility of output, interest rates and exchange rates are higher in emerging economies. The reason for the weak performance is explained by the idea that the emerging market inflation targeters are faced with low credibility, weak institutions, instable macroeconomic environment and external shocks. The authors recommend the emerging countries to increase the level of communication and transperancy, treat the targets as a communication mean, and develop a methodology for the convergence course after a shock.

A different selection of country and period sample is used by Petursson (2005) in his study of twenty one targeting countries (both emerging and industrial) and six non-targeting industrial countries. Inflation targeting is found to have a statistically significant effect on the inflation targeters even after accounting for global disinflation and domestic business cycles. However, the results change when the country sample is reduced to include only the five industrial inflation targeting countries. Petursson explains that the reason behind these insignificant results for the industrial countries is that they already achieved most of their disinflation prior to the adoption of inflation targeting. Commenting on the decline in the inflation volatility in inflation targeters and non targeters, the author emphasizes the idea that the fluctuations are still higher than the rage usually set on the target ($\pm 1\%$), which may damage the credibility of the central bank. The most common action of central banks under

Kuttner and Laxton (2005) use difference in difference methodology, while Lin and Ye use propensity score matching to account for selection bias.

this situation is to set long term targets and define actions to be taken in case of large deviations.

Vega and Winkerlried (2005) have as main goal to study the development of inflation dynamics (mean, variance, and persistence) caused by inflation targeting through a propensity score match methodology. They found out that inflation targeting caused a decrease in level and volatility of inflation in the targeting countries. This decrease was at a higher degree for soft inflation target compared to fully-fledged target. Moreover, it was pointed out that for developing countries, the inflation targeting managed to reduce the persistence of inflation because of the nominal anchor.[4] Their results show that inflation targeting achieves low inflation in both developed and developing countries but the changes are higher in developing markets.

A study with a wider focus is conducted by Mishkin and Hebbel (2007) on the impact of inflation targeting in twenty one inflation targeters, out of which thirteen emerging countries and eight industrial. They set the control group to be restrictive and include thirteen industrial countries. Based on three different empirical works (difference in difference, panel var, and panel impulse response) they found out that targeters performed better in terms of lowering the inflation level and inflation volatility. They observe also that they improved both in terms of efficiency of monetary policy and in macroeconomic performance as a result of the increase in credibility. However, it is highlighted that the non targeting industrial countries experienced higher levels of monetary policy efficiency and better macro performance. They study also the performance of the central banks in achieving the targets, and come to the conclusion that at first glance it seems like inflation targeting countries are characterized by more deviations from targets but once country and time specific effects are taken into account, it is observed that inflation deviations are smaller for targeters.

Shifting away from the general focus of studies on the impact of inflation in inflation and economic growth, Divino (2009)[5] observes a group of emerging and developing inflation targeting countries and arrives at the conclusion that targeting economies managed to lower unemployment rate by five per cent in the post period compared to the non targeting countries, after controlling for the reversion to the mean. In terms of volatility of unemployment, no difference is observed between the two groups. However, the estimated coefficient on the

[4]See also Levin et al (2004) who argue that in IT countries, inflation persistence decreases while expectations are better anchored. See also Gurkaynak et al (2006).

[5]Divino (2009) uses a difference in difference method.

economic growth, its volatility and the inflation targeting dummy are found to be not significant. Additionally, Rose (2006) provides an analysis on the international implications of inflation target in terms of exchange rate volatility, 'sudden stops' of capital inflows, reserves and current accounts. In a sample of sixty three countries (twenty three IT), the results show that inflation targeters score lower exchange rate volatility and switching to an inflation targeting regime is seen to be accompanied with a decline in the frequency of sudden stops. However, in terms of reserve and current account, imbalances are similar for both inflation targeters and non targeters.

5.4 Inflation targeting and financial crisis

Until the financial crisis of 2007, inflation targeting was considered the state of art in the world of policymakers but the crisis was accompanied with a stream of economists criticizing the framework. *"It is with regret that we announce the death of inflation targeting"*, writes Jeffrey Frankel (2012) stating that inflation target death in 2008 was caused by the inflation targeting central banks which did not pay the right attention to asset-price bubbles. He argues that these central banks should have known than boom-bust cycles happen also in a low inflation environment and they should have responded appropriately to asset bubbles.

The financial crisis questioned the stability of the inflation targeting framework and urged the central banks to make necessary changes in the framework in order to ensure financial stability. Woodford (2011) suggests that inflation targeting would be considered a failure only in the case that it has not fulfilled its main characteristics but the period since 2008 has proved that it has not failed. The financial crisis of 2007 has been compared with the recession of 1930s but unlike it, it has not experienced deflationary twists. The study strongly supports the idea that this maybe because of anchored inflation expectations in inflation targeting economies.

Positive results are shown in one of the latest studies on the performance of fifty one industrial and emerging inflation targeting economies during the 28 months of financial crisis by Filho (2011). He concludes that due to the flexible monetary policy, inflation targeters managed to lower both nominal and real interest rates more than other countries, avoiding high deflationary threats. Further, a sharp real depreciation was observed in targeting countries, which not perceived risky by governments had the positive impact of switching the

demand of the people to domestic goods. In terms of GDP growth, targeters experienced smaller decrease in GDP growth compared to other countries, ranking the inflation targeting countries among the best performing ones.

Fouejieu (2012)'s comparison of the targeting economies with non targeting economies for the period 2008/2009, explains that inflation targeting central banks experienced a lower increase in inflation fluctuations and real interest rates. However, contrary to Filho's results, no significant difference was observed between the two groups regarding GDP growth. Arguing that the crisis found targeters in better economic conditions regarding government debt, current account balance, inflation rate and interest rate volatility, Fouejieu (2012) raises the question of why the targeters did not perform better. He provides the following explanations to this outcome: a) countries can be affected by crisis despite the regime they follow; b) open economies were affected more by the crisis, and since inflation targeters are considered economically and financially open, they also were affected by crisis; and c) the focus of monetary policy on inflation has neglected the importance of financial stability.

Chapter 6

Empirical analysis

A consolidated group of empirical works on inflation target developed in the past two decades use a variety of different econometric methods to evaluate the performance of the inflation targeters compared to non targeters. An assessment of some of these studies in the literature review part shows that some of these methods are: difference in difference approach; panel estimation; VAR analysis; etc.

The *difference in difference* method is considered often as an experimental and econometric approach to measure the effect of a specific treatment on two groups over two periods of time. It is based on the comparison of the performance of inflation targeting countries with non inflation targeting countries in the periods before and after the adoption of the framework. Having in mind that one of the main criticisms of this approach is the reversion to the mean bias, Ball and Sheridan (2005) introduce a model which measures the effect of inflation targeting but also controls for the change in performance attributed mainly to the reversion to the mean. This method was later used in many studies.[1] The empirical part of this study will be focused on the widely used 'difference and difference' approach. The main focus of this method is to observe if inflation targeting improved the performance of the targeting countries in terms of average inflation, inflation volatility, output growth, growth volatility and dollarization.

[1]Batini, Kuttner and Laxton (2005), Gonçalves and Salles (2008), Geymael et al (2011), Fouejieu (2011).

6.1 Data sample

This section introduces the countries in the sample, period of study and the macroeconomic variables to be examined. For this analysis are chosen twenty nine countries, out of which eighteen are countries in Central and Eastern Europe and eleven countries from the Commonwealth of Independent States. There are nine inflation targeting countries in the sample and all of them have at least three years of inflation targeting experience, with Albania and Georgia being the last countries to have adopted inflation targeting in 2009.[2] The reasons behind the selection of this group of countries are related to the close regional allocation and different degrees of dollarization.[3]

The main macroeconomic variables of interest are inflation, inflation volatility, output growth, output growth volatility and deposit dollarization. The data for average inflation and output growth have been taken from the IMF database World Economic Outlook (October 2012), while the data regarding dollarization measures is collected from the national central banks.[4]

Since these countries are characterized by several periods of hyperinflation prior to 1997, all the periods with inflation higher than 50% will be excluded from the estimation.[5] Therefore the baseline estimation will be conducted without these hyperinflation periods, which is generally advised since countries experienced hyperinflation in the period before application and than a drastic drop in inflation was observed. This aims to remove the chance that a group of countries with periods of hyperinflation increase the degree of inflation targeting impact on the performance of the economy. In this sample, both inflation targeting countries and non inflation targeting countries experienced high inflation until mid-90s.

The time period under study is from 1990 to 2011, but the baseline model will include years between 1997 and 2011, including also the period of financial crisis.[6] The time frame will be divided into pre- and post- period for both

[2]The inflation targeters in the sample are: Albania, Armenia, Czech Republic, Georgia, Hungary, Poland, Romania, Serbia, and Turkey. Moldova is not considered an inflation targeter in the empirical part due to its short period of adoption.

[3]Being in the same region is believed to reduce selection bias.

[4]In the case of the Czech Republic, some inflation data and data on dollarization are taken from the Czech National Bank.

[5]Ball (2010) recommends deleting the countries which have periods with hyperinflation. Since the region from which the countries were selected experienced high inflation prior to 1997, it is not wise to follow Ball (2010) approach. Meanwhile, Gonçalves and Salles (2008) decide to delete the periods with inflation higher than 50%.

[6]Further divisions regarding the period under study will be explained in the 'Methodology section'.

inflation targeting countries and non inflation targeting ones. For the inflation targeting countries, the date dividing the periods will be considered the year when the inflation target was announced.[7] Meanwhile, for the non-targeters, the year breaking the periods into pre- and post- adoption of inflation target, will be considered average adoption date for the targeting countries in the sample, which is year 2004.

6.2 Inflation and output statistics

Comparative detailed descriptive statistics on inflation performance and inflation volatility is presented in Table A.1 (Appendix A) for nine inflation targeting countries for the period prior and after adoption of inflation targeting. For comparison with this group, it presents also the values of average inflation and its volatility for twenty non inflation targeters. Inflation targeters reduced their average inflation rate from 14.57 percent in the period before adoption to 5.8 percent after adoption.[8] Meanwhile, for the non inflation targeters, average inflation rate fell from 10.68 percent to 7.3 percent. Average inflation fell more in the group of the inflation targeting economies after the adoption of inflation target, compared to the average inflation in the group of non targeting countries. A similar pattern is observed for inflation volatility, which for inflation targeters has dropped from 9.82 percent to 2.28 percent in the period after adoption.[9] For the non targeters, the volatility has changed from 7 percent to 4.31 percent. Since a decrease in both average inflation and inflation volatility is observed in both targeting and non targeting countries, a conclusion cannot be drawn yet on the impact of the inflation targeting.

Table 6.1: Descriptive statistics for group performance

Group	Inflation				GDP growth			
	Pre-period		Post period		Pre-period		Post period	
	Mean	Volatility	Mean	Volatility	Mean	Volatility	Mean	Volatility
Average (NIT)	10,68	7,00	7,30	4,31	6,24	3,67	4,86	5,25
Average (IT)	14,57	9,82	5,80	2,28	5,73	3,92	3,18	4,26

Source: : IMF World Economic Outlook

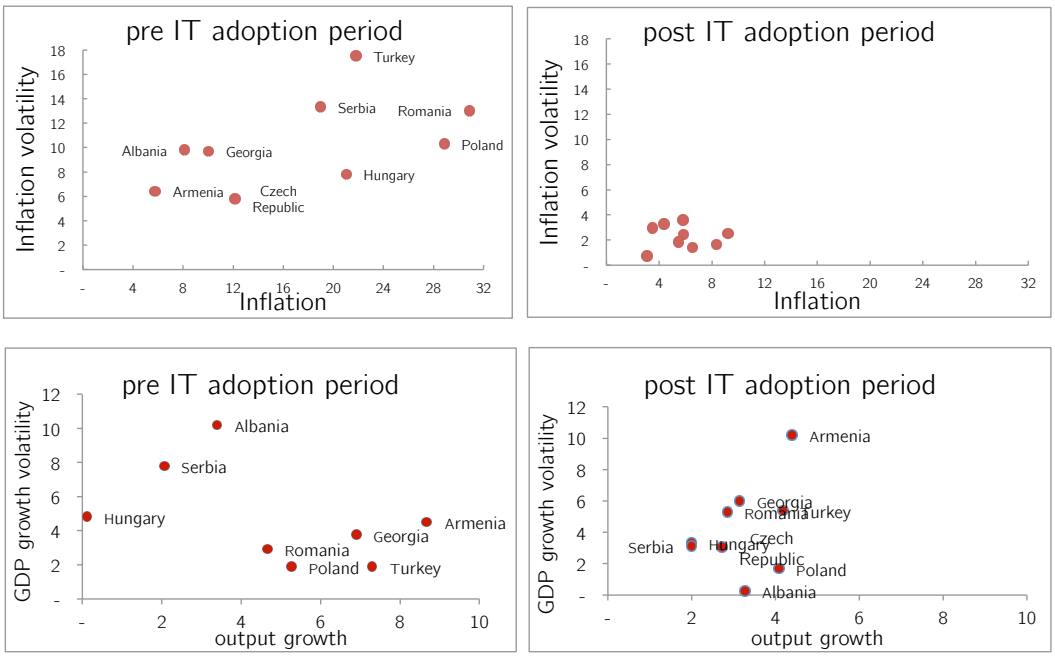
Similarly, Table A.2 (Appendix A) presents output growth and output growth volatility for the twenty nine countries in the sample. Average out-

[7] Similar to the approach by Bernanke et al. (1999).
[8] Refering to baseline model 2 for period 1997-2011.
[9] Inflation volatility is measured as standard deviation of inflation.

put growth for non targeters fell from 6.24 percent to 4.86 percent while for targeters the drop was from 5.73 percent to 3.18 percent. Meanwhile GDP growth volatility increased from 3.67 percent to 5.25 percent for non targeters and 3.92 percent to 4.26 percent for targeters. Based on these general statistics, the inflation targeting group experienced a larger decline in output growth but a lower increase in output volatility compared to the non targeters. This general statistics regarding output growth makes it more difficult to understand the role of IT.

Moreover, Figure 6.1, depicts the main macroeconomic variables under study in the inflation targeting countries for the period before and after adoption of inflation target. Visual inspection of the Figure 6.1 confirms the above observations on descriptive statistics. Both inflation level and inflation volatility in the inflation targeters have decreased in the post inflation target adoption period, and a convergence of the countries as a group is observed towards lower left side of the graph. On the other hand, the same observation cannot be made regarding output growth. In most of the countries, the output growth volatility fell, but a conclusive description regarding output growth is not observed.

Figure 6.1: Inflation and output growth in inflation targeting economies



Source: IMF, World Economic Outlook (October 2012)

6.3 Methodology

As already explained, a difference-in-difference method is a cross country analysis used also to address the impact of inflation targeting. This method consists in regressing the difference of an economic variable affected by inflation target in the period before and after the IT adoption to a dummy variable for targeters and was first proposed by Ball and Sheridan (2005). In order to remove possible bias, Ball and Sheridan (2005) accounted for the reversion to the mean. In this thesis the effect of inflation targeting will be estimated for the following economic variables: inflation level, inflation volatility, output growth, output growth volatility and deposit dollarization.

The Ball and Sheridan (2005) model used in this empirical analysis is:

$$X_{post} \text{ - } X_{pre} = a_0 + a_1 D + a_2 X_{pre} + \epsilon$$

X_{post}	Average value of variable X after the adoption of IT
X_{pre}	Average value of variable X before the adoption of IT
D	Policy dummy
	(1 if the country is an inflation targeter and 0 if it is non- targeter)
a_0	Constant
ϵ	Error term

The most important element of the model is a_1 which measures the effect of inflation targeting on the economic variables X taken into consideration as a measure of economic performance, given the initial conditions on X. Suppose X measures average inflation. A significant and negative a_1 shows that inflation targeters experienced a larger decrease in average inflation compared to non-targeters. Similarly, if X measures output growth, a significant and positive a_1 shows that inflation targeters performed better.

The idea behind this methodology is simple and straightforward. The first step is to calculate the average X for each country in the pre-period and post-period. Then, calculate the average X for inflation targeters and non-inflation targeters as groups.[10] From a first glance, a cross-country difference in average inflation and inflation volatility is observed. For example, in the pre-period 1997-2011, average inflation ranges from double digits (higher than 15%) in

[10]See Table A.1 for detailed results on average levels of inflation and inflation volatility.

Belarus, to low single digits in Azerbaijan, Macedonia, and Latvia. In the post period, almost all targeting countries[11] and most of the non-IT countries experienced a decrease in average inflation.

For robustness check, it is experimented with different country and period samples in different regressions. The first model (Model 1) covers a period of 21 years between 1990 and 2011 and excludes all years with inflation higher than 50%. Since, there are many new countries in the sample data is missing for many of them until mid-90s. For this reason, the baseline model for this empirical study will be Model 2 which is estimated with the same country sample but over a shorter period of time 1997-2011.[12] Moreover, Model 3 and Model 4 are estimated over the same period of time and same country sample as Model 2. Model 3 is estimated without reversion to the mean to observe the change in significance of a_1, while Model 4 excludes countries which continue to lack data in the shorter period 1997-2011, Kosovo, Bosnia and Herzegovina and Montenegro. To increase the level of homogeneity, Fouejieu (2012), recommends selecting the control group of non targeting countries based on GDP per capita criteria. The control group should include countries with GDP per capita not higher than the richest inflation targeting country, and not lower than the poorest inflation targeter.[13])

Table 6.2: Period and country samples

Model	Period	Description
Model 1	1990-2011	All countries in the sample
Model 2	1997-2011	All countries in the sample*
Model 3	1997-2011	Same country sample as Model 2 but without revesion to the mean
Model 4	1997-2011	Kosovo, Montenegro and Bosnia and Herzegovina removed from the sample since they lack data for some years.
Model 5	1997-2011	Include in control group only countries with GDP per capita as high as the richest inflation targeter and as low as the poorest inflation targeter.

*Czech Republic is not included since it adopted IT in 1997 and a pre-period does not fall into Model 2.

[11]For the Model 3, only four non-IT countries experienced an increase in average inflation.

[12]Czech Republic cannot be included in this regression since it adopted inflation targeting in 1997 and a pre-period cannot be calculated.

[13]The richest inflation targeter is Czech Republic, and Slovenia is droped since it has a higher level GDP per capita. On the lower limit, Georgia is the poorest target in terms of GDP, therefore, Moldova, Uzbekistan, Kyrgys Republic and Tajikistan, with lower level of GDP per capita. (See Table A.4

6.4 Empirical Results

Inflation

In four sample models regressed for robustness check, the inflation target dummy is statistically significant and has a negative sign (see Table 6.3). The regression results for the first model, covering the period 1990-2011, show that average inflation in non-IT countries would have fallen by 2.796 percentage points more if they had adopted inflation targeting. Similar results are obtained for Model 2, with the period 1997-2011, when the coefficient for the IT dummy is -2.53, showing that average inflation fell more by 2.53 percentage points in inflation targeting countries. This effect is statistically significant at 90% confidence level.

Model 3 is estimated without taking into consideration the reversion to the mean, in order to understand the significance of this term in the model. The coefficient a1 is still significant and negative but considerably higher (5.1p.p) compared to Model 2. This coefficient is almost same as the difference in difference between the means of targeters and non targeters in the period pre and post. Higher coefficient in Model 3 means that without introducing the reversion to the mean term in the model, a1 coefficient on IT dummy captures also the effects caused by the reversion to the mean. These results confirm the Ball and Sheridan (2005) emphasis on the importance of the reversion to the mean, because otherwise the results obtained are biased.

Moreover, as it was already mentioned, this region of countries is quite problematic in terms of data. Although Model 2 includes data from 1997, some countries, like Kosovo, Montenegro and Bosnia and Herzegovina continue to lack data for a couple of years. Therefore, for robustness check, Model 4 is regressed without taking these countries into consideration for period 1997-2011. The coefficient for inflation target dummy is still negative and significant. Compared to Model 2 results, this coefficient is slightly higher (2.793 p.p) and more significant. However, once accounting for a control group similar to

Table 6.3: Regression results for inflation

	INFLATION				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
IT dummy	-2,796	-2,351	-5,105	-2,793	-2,209
	(1.199)**	(1.073)*	(2.869)*	(1.175)**	1,337
Initial condition	-0,737	-0,708		-0,719	-0,727
	(0.061)***	(0.061)***		(0.062)***	(0.072)***
Constant	3,984	4,177	-3,384	4,775	4,31
	(1.004)***	(0.899)***	(1.533)**	(0.962)***	(0.975)***
No. of obs	29	28	28	25	23
Adj-R-squared	0,86	0,85	0,07	0,86	0,85

Notes: Standard errors are in parentheses.
*Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistically significant at the 1 percent level

targeting group in terms of GDP per capita in Model 5, the inflation targeting coefficient becomes insignificant.

Similar to the results on inflation, the regression results show that inflation volatility fell ceteris paribus, more in the IT countries than for non-IT countries by 2.14 percentage points in Model 1 and 2.58 percentage points in Model 2. In the robustness check model 4, inflation volatility is observed to fall by 2.75 percentage points. In model 2, adjusted R-squared for regression on inflation is 85% while for inflation volatility 78%, showing a good explanation of data by the model. An increase in adjusted R-squared is observed in Model 4 where the countries included have available data for all years under study. Model 3, which is regressed to understand the importance of the reversion to the mean shows a very low adjusted R-square in both cases. However, although Model 5 presented insignificant results in terms of inflation, it presents negative and statistically significant inflation targeting coefficient, in terms of inflation volatility.

As observed in the regressions for inflation and inflation volatility, the coefficient for the initial condition is negative and highly significant in all cases, showing a considerable impact of the reversion to the mean. Therefore, inflation would have dropped in the inflation targeting countries even if no inflation target was adopted but the adoption of inflation targeting helped decline more.

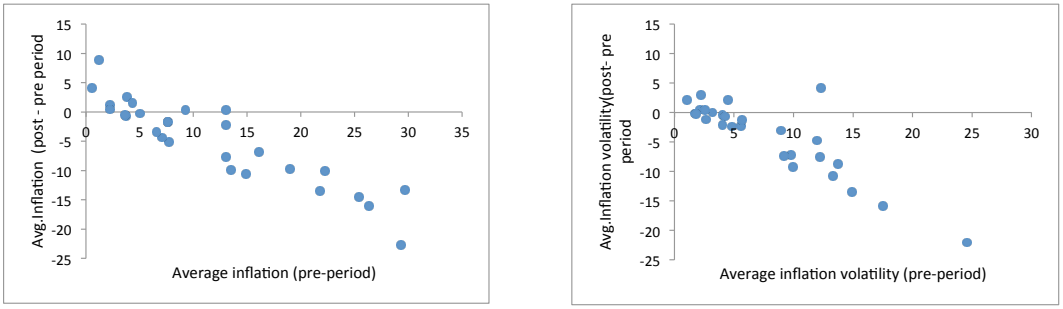
Table 6.4: Regression results for inflation volatility

	INFLATION VOLATILITY				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
IT dummy	-2,141	-2,578	-5,091	-2,748	-2,685
	(1.144)*	(1.313)*	(2.598)*	(1.410)*	(1.499)*
Initial condition	-0,898	-0,890		-0,890	-0,909
	(0.105)***	(0.100)***		(0.108)***	(0.118)***
Constant	3,361	3,540	-2,690	3,709	3,837
	(1.166)***	(0.959)***	(1.323)*	(1.077)***	(1.08)***
No. of obs	29	27	27	24	22
Adj-R-squared	0,74	0,78	0,10	0,78	0,78

Notes: Standard errors are in parentheses.
*Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistically significant at the 1 percent level

Figure 6.2 shows the inflation convergence[14] in the inflation targeting countries. The graph on the left plots the difference between average inflation in the post period and average inflation in the pre period in the y-axis against the pre period average inflation in the x-axis. Similarly, the graph on the right shows the negative relation between the difference in post inflation volatility with pre inflation volatility in the y axis and pre inflation volatility in the x axis. The negative relation is clear from both figures.

Figure 6.2: Reversion to the mean for inflation



Source: Data from IMF World Economic Outlook

[14]Ball and Sheridan (2005) consider the observed inflation convergence as a characteristic of a cross country performance regarding inflation. Hyvonen (2004) attributes the inflation convergence to the monetary policy in place and considers it an objective of the policy.

Output growth

The same method used for inflation is used to analyze output growth and its volatility, using data on output growth at constant prices from the IMF World Economic Outlook. The descriptive statistics show that the average output growth fell for both targeting countries and non targeting countries from the period before adoption to the period after adoption. Meanwhile, the regression results presented in Table 6.5 do not confirm that inflation target adoption had a positive effect in the output growth. However, based on the economic theory, positive results are not expected, but it is important that no negative effect is observed, showing that the disinflation is not achieved at the expense of output growth. The negative sign is observed in all the regressions, which means that inflation targeting countries experience a more pronounced slowdown of output growth but none of the results is significant.

Table 6.5: Regression results for GDP growth

	OUTPUT GROWTH				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
IT dummy	-1,282	-1,487	-1,504	-1,836	-1,202
	1,060	1,091	1,124	1,152	1,182
Initial condition	(-0.515)**	-0,405		-0,289	-0,341
	0,235	0,252		0,279	0,289
Constant	2,153	1,315	-0,985	1,001	0,671
	1,369	1,546	0,601	1,640	1,855
No. of obs	29	28	28	25	23
Adj-R-squared	0,12	0,08	0,03	0,07	0,01

Notes: Standard errors are in parentheses.
*Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistically significant at the 1 percent level

Regarding the output growth volatility, the regression results show that the IT coefficient is negative but never statistically significant. These results are similar to Batini, Kuttner and Laxton (2005) while Gonçalves and Salles (2008) observe a larger fall in growth volatility for inflation targeting countries.

Meanwhile, the reversion to the mean continues to be important and significant for both output growth and output growth volatility, but to a lesser value compared to the average inflation and inflation volatility. This conclusion is

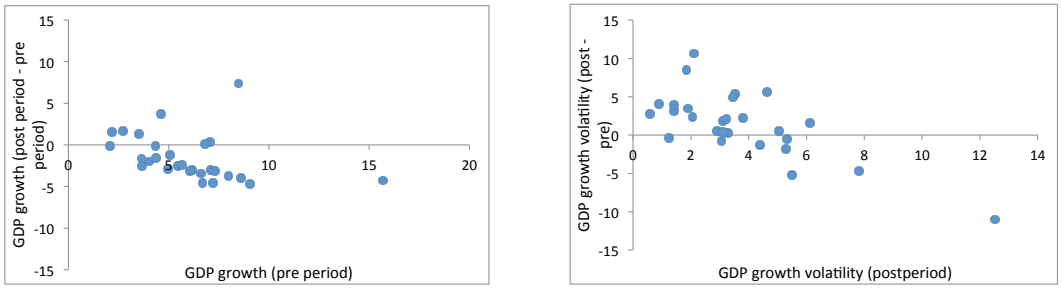
Table 6.6: Regression results for GDP growth volatility

	OUTPUT GROWTH VOLATILITY				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
IT dummy	-0,478	-0,243	-0,739	-0,612	-0,967
	1,291	1,366	1,908	1,487	1,399
Initial condition	-1,283	-1,227		-1,033	-1,371
	(0.225)***	(0.245)***		(0.383)**	(0.256)***
Constant	6,228	5,933	1,616	5,539	7,223
	(1.105)***	(1.107)***	0,971	(1.439)***	(1.254)***
No. of obs	28	27	27	24	22
Adj-R-squared	0,54	0,47	-0,03	0,21	0,57

Notes: Standard errors are in parentheses.
*Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistically significant at the 1 percent level

confirmed by the Figure 6.3, showing that the negative relationship is still in place but not as obvious as in the case of inflation.

Figure 6.3: Reversion to the mean for GDP growth



Source: Data from IMF World Economic Outlook

Dollarization

From the short descriptions on the rationale for adoption of inflation targeting of the nine countries in the sample, it was observed that for some of them, the issue of dollarization was considered an important condition to be taken into account when deciding the type of monetary policy. Also, the literature review showed that it has been argued that highly dollarized economies face constraints in conducting independent monetary policy. To test whether the

benefits of inflation targeting in terms of inflation and inflation volatility, observed in the previous sections, have been affected by the degree of dollarization, a cross-term of inflation target and deposit dollarization is included in the Ball and Sheridan (2005) model:

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + a_3 dd + a_4 dd * D + \epsilon,$$

where the X variable is average inflation, D is the inflation target dummy, dd is deposit dollarization and $dd * D$ is the cross-term on deposit dollarization and inflation target. To avoid endogeneity, the deposit dollarization level in the last year before the adoption of inflation targeting is used for all the inflation targeters. The time period is from 1997 to 2011 as defined in Model 2 for 27 countries in the sample.[15]

Table 6.7: Regression results on dollarization

	Inflation 1997-2011	**Inflation volatility 1997-2011**
IT dummy	(-6.081)	(-3.791)
	(3.047)*	3,622
Initial condition	(-0.703)	(-0.867)***
	(0.065)***	0,103
Dollarization	(-0.743)	2,554
	2,584	2,730
IT dummy*dollarization	8,049	1,840
	1,566	6,714
Constant	4,392	2,314
	(1.566)***	1,655
No. of obs	27	26
Adj-R-squared	0,85	0,78

Notes: Standard errors are in parentheses.
*Statistically significant at the 10 percent level
** Statistically significant at the 5 percent level
*** Statistically significant at the 1 percent level

The empirical results on inflation show a negative and significant coefficient of inflation target dummy while the coefficient of the cross-term on inflation

[15]Information on deposits could not be found on the website of the Central Bank of Uzbekistan and Russia does not report the deposits divided in national currency and foreign currency.

target and dollarization is statistically non-significant. Therefore, it can be assessed that the degree of deposit dollarization does not have an impact on the benefits of inflation targeting in terms of inflation. These results confirm the trend presented in Figure 3.2 of continuous declines in inflation levels also in highly dollarized inflation targeting economies.

However, the results on inflation volatility are inconclusive, since both the coefficient of inflation target dummy and the coefficient of the cross-term are not significant.[16]

[16]Another empirical model is regressed to observe if IT adoption contributes in lowering the degree of dollarization. For this reason, the difference in difference model by Ball and Sheridan (2005) is used to regress the difference in post period average deposit dollarization level and pre period average deposit dollarization level to the inflation target dummy and the pre period average deposit dollarization level. Therefore, dollarization is placed as a right-hand side variable in the model.

The results obtained show insignificant coefficients for IT dummy and the average dollarization in the pre period. Moreover, the R-squared value is low, showing not a good fit of the model. It can be concluded that these results are inconclusive for the period and country sample under study. However, if the same study were to be conducted in the future, to allow for a longer experience with inflation targeting, maybe results may change. Detailed results are presented in Appendix A (Table A.5).

Conclusion

In economies of Central and Eastern Europe and Commonwealth of Independent States inflation targeting has been adopted for many years but can still be considered a new policy regime. The first countries to adopt inflation targeting were Czech Republic and Poland, marking also the start of inflation target adoption by emerging countries in the World. Later on, other countries followed the way, with the latest being Moldova. The short period of time since adoption, combined with the small number of countries in the group make any study on the matter slightly preliminary which would need to be developed further in the years to come. However, this thesis aims to bring two novel elements to the literature on inflation targeting. First, to the current author's knowledge, no other study has been conducted focusing in this group of countries within the two close regions. Second, it seeks to provide a new analysis on the impact of dollarization on the benefits of inflation targeting.

The general description of inflation targeting framework with a specific focus on the nine inflation targeting countries in the sample, shows that despite the differences in economic performance or political situation between the countries, the general institutional framework of inflation targeting is similar in all the economies. However some of the inflation targeting countries in these two regions decided to slowly transition to inflation targeting after attempting to put in place some essential infrastructure for the new regime. Not all necessary preconditions were in place even after adoption, but they achieved improved conditions gradually by close collaboration between central banks. In terms of deposit dollarization, most of the countries have moderate or high degree of dollarization. This did not seem to be an obstacle in the process of lowering inflation but it is generally suggested that policymakers put considerable emphasis on dollarization when designing the proper monetary policy.

The empirical evidence found in the country and period sample under study is positive both in terms of inflation level and inflation volatility, which fell more in countries adopting inflation targeting compared to non-targeters.

However, as already supported by literature evidence, no negative effect by inflation targeting is observed on output growth or output growth volatility. On the other hand, it was found that the degree of dollarization does not have any impact, either positive or negative, in the benefits of inflation target in terms of inflation. No conclusive results can be drawn regarding the effect of inflation targeting framework in lowering the degree of dollarization. A simple reason for this can be the relatively short period of adoption of inflation targeting for the economies with high level of dollarization.

To conclude, inflation targeting remains an attractive regime for the region and other countries are expected to join the inflation targeters group, leaving room for further studies in the future. Despite the attempt of critics to diminish the reputation of this framework as 'the state of art' after the financial crisis, it is not losing its importance and attention from scholars, economists, and policy makers.

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Appendix A

Tables

Table A.1: Detailed descriptive statistics in inflation and inflation volatility

	Pre-period (Model 1)		Pre-period (Model 2)		Post period	
Country	Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation
1 Belarus	29,69	12,29	29,69	12,29	16,36	16,50
2 Bosnia and Herzegovina	2,26	2,18	2,26	2,18	3,44	2,69
3 Bulgaria	7,60	5,60	7,60	5,60	5,98	3,36
4 Croatia	3,54	1,61	3,75	1,72	3,02	1,55
5 Estonia	12,74	14,61	5,05	3,21	4,77	3,23
6 Kazakhstan	12,57	10,65	9,25	4,04	9,54	3,58
7 Kosovo	3,62	5,70	3,62	5,70	3,05	4,39
8 Kyrgyz Republic	18,01	15,07	13,08	11,99	10,83	7,26
9 Latvia	9,93	11,36	3,84	2,20	6,44	5,24
10 Lithuania	0,61	1,04	0,61	1,04	4,69	3,18
11 FYR Macedonia	3,61	4,83	2,25	2,54	2,70	2,96
12 Moldova	18,26	11,81	16,11	12,23	9,24	4,69
13 Montenegro	13,51	9,79	13,51	9,79	3,62	2,59
14 Russia	28,72	24,08	26,34	24,58	10,35	2,56
15 Slovak Republic	8,27	2,97	7,74	2,68	2,65	1,51
16 Slovenia	11,04	7,92	7,04	1,79	2,67	1,56
17 Ukraine	13,04	9,00	13,04	9,00	13,41	5,92
18 Azerbaijan	3,25	7,47	1,18	4,46	10,08	6,56
19 Uzbekistan	26,22	14,09	22,26	9,21	12,22	1,87
20 Tajikistan	25,41	13,76	25,41	13,76	10,89	5,02
Average (NIT)	**12,60**	**9,29**	**10,68**	**7,00**	**7,30**	**4,31**
1 Albania	8,13	9,82	6,57	9,96	3,08	0,75
2 Armenia	5,78	6,41	4,34	4,82	5,83	2,48
3 Czech Republic	12,17	5,78			3,51	2,94
4 Georgia	10,03	9,69	7,59	4,24	5,79	3,59
5 Hungary	21,05	7,80	13,08	4,03	5,48	1,83
6 Poland	28,86	10,28	14,90		4,36	3,30
7 Romania	30,84	13,04	29,28	14,90	6,53	1,44
8 Serbia	19,00	13,34	19,00	13,34	9,24	2,54
9 Turkey	21,81	17,48	21,81	17,48	8,35	1,68
Average (IT)	**17,52**	**10,41**	**14,57**	**9,82**	**5,80**	**2,28**

Source: IMF World Economic Outlook

Table A.2: Detailed descriptive statistics in output growth and output growth volatility

	Pre-period (Model 1)		Pre-period (Model 2)		Post period	
Country	Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation
1 Belarus	7,07	3,28	7,07	3,28	7,37	3,59
2 Bosnia and Herzegovina	5,45	2,90	5,45	2,90	2,94	3,39
3 Bulgaria	6,15	1,40	6,15	1,40	3,16	4,58
4 Croatia	4,17	2,12	3,65	2,05	1,14	4,35
5 Estonia	5,81	4,14	7,21	3,51	2,63	8,83
6 Kazakhstan	6,11	5,38	6,80	5,30	6,92	3,49
7 Kosovo	8,58	12,51	8,58	12,51	4,60	1,50
8 Kyrgyz Republic	4,17	4,48	5,05	3,11	3,88	3,55
9 Latvia	5,21	3,26	6,69	1,85	2,14	10,34
10 Lithuania	5,96	3,25	6,06	3,46	2,97	8,38
11 FYR Macedonia	1,75	2,89	2,17	3,06	3,65	2,31
12 Moldova	1,45	5,51	2,72	5,33	4,37	4,87
13 Montenegro	7,99	1,41	7,99	1,41	4,24	5,37
14 Russia	3,34	5,44	4,33	5,04	4,16	5,54
15 Slovak Republic	4,47	3,23	3,51	3,11	4,84	4,94
16 Slovenia	4,00	0,89	4,02	0,88	2,03	4,91
17 Ukraine	4,97	6,13	4,97	6,13	2,09	7,75
18 Azerbaijan	7,82	2,79	8,48	2,10	15,86	12,77
19 Uzbekistan	15,68	4,38	15,68	4,38	11,39	3,10
20 Tajikistan	6,08	5,04	8,20	2,68	6,74	1,36
Average (NIT)	**5,81**	**4,02**	**6,24**	**3,67**	**4,86**	**5,25**
1 Albania	3,39	10,19	5,68	5,51	3,27	0,25
2 Armenia	8,68	4,52	9,07	4,62	4,40	10,21
3 Czech Republic	4,54				2,72	3,05
4 Georgia	6,89	3,79	6,59	3,79	3,14	6,00
5 Hungary	0,11	4,82	3,65	0,58	2,00	3,33
6 Poland	5,27	1,89	7,09		4,08	1,69
7 Romania	4,67	2,92	4,38	3,24	2,85	5,30
8 Serbia	2,07	7,81	2,07	7,81	1,99	3,12
9 Turkey	7,30	1,91	7,30	1,91	4,18	5,38
Average (IT)	**4,77**	**4,73**	**5,73**	**3,92**	**3,18**	**4,26**

Source: IMF World Economic Outlook

Table A.3: General Economic Indicators

Countries	**Population** (millions)	**GDP per capita** (in USD)	**Investment** (as % of GDP)	**Exports of goods and services** (%GDP)	**Imports of goods and services** (%GDP)	**Share of world GDP**	**World bank classification**
Albania	3,23	4019,99	24,95	33,80	56,00	0,02%	Lower middle income
Armenia	3,33	3076,41	30,76	23,48	48,09	0,01%	Lower middle income
Czech Republic	10,53	20435,88	24,54	72,55	68,53	0,31%	High income OECD
Georgia	4,47	3210,30	26,23	36,45	55,12	0,02%	Lower middle income
Hungary	9,99	14050,01	19,07	92,27	84,91	0,20%	High income OECD
Moldova	3,56	1968,95	24,49	45,02	86,22	0,01%	Lower middle income
Poland	38,20	13468,66	21,72			0,73%	High income OECD
Romania	21,38	8874,62	28,81	38,34	43,49	0,27%	Upper middle income
Serbia	7,57	5725,16	18,93	36,08	51,22	0,07%	Upper middle income
Turkey	74,72	10362,61	23,82	23,74	32,63	1,11%	Upper middle income
Mean IT	17,70	8519,26	24,33	44,64	58,47	0,28%	
Median IT	8,78	7299,89	24,51	36,45	55,12	0,13%	
Mean non-IT all	16,56	9378,58	23,05	54,83	60,65	0,21%	
Median non -it all	5,49	7312,09	22,41	54,54	65,33	0,06%	

Source: World Economic Outlook IMF

Table A.4: GDP per capita in targeters and non-targeters

No.	Country -IT	GDP per capita
1	Czech Republic	20.677
2	Hungary	14.043
3	Poland	13.352
4	Turkey	10.524
5	Romania	8.874
6	Serbia	6.312
7	Albania	4.030
8	Armenia	3.305
9	Georgia	3.203

No.	Country -NIT	GDP per capita
1	Slovenia	24.132
2	Slovak Republic	17.782
3	Estonia	16.534
4	Croatia	14.193
5	Lithuania	14.100
6	Latvia	13.727
7	Russian Federation	12.995
8	Kazakhstan	11.357
9	Bulgaria	7.283
10	Montenegro	7.111
11	Azerbaijan	6.912
12	Belarus	5.820
13	Macedonia, FYR	5.058
14	Bosnia and Herzegovina	4.821
15	Ukraine	3.615
16	Kosovo	3.579
17	Moldova	1.967
18	Uzbekistan	1.546
19	Kyrgyz Republic	1.124
20	Tajikistan	935

Source: World Bank Database

Table A.5: Regression results on deposit dollarization

	Dollarization
	Model 2
IT dummy	0,004
	0,040
Initial condition	(-0.0797)
	0,083
Constant	0,017
	0,049
No. of obs	27
Adj-R-squared	(-0.04)

Source: Central Banks

Appendix B

Difference in Difference Methodology

The empirical model presented in the methodology part is a derivation of several detailed steps and analysis conducted by Ball and Sheridan (2005). The authors start from the following equation:

$$X_{it} = k + a_1 Q_{it} + \mu_i + \eta_t + \upsilon_{it},$$

where X_{it} is the value of macroeconomic variable X in country i and time t, Q_{it} is the inflation targeting dummy equal to 1 if the country is a targeter and 0 otherwise, μ_i and η_t are the country specific effect and time specific effects, respectively, while $\upsilon_i t$ is the error term. First differencing the equation over time gives the following equation for cross country analysis:

$$X_{i,post} - X_{i,pre} = (\eta_{post} - \eta_{pre}) + a_1 D_i + (\upsilon_{i,post} - \upsilon_{i,pre}),$$

where macroeconomic variable X depends on a constant $(\eta_{post} - \eta_{pre})$, an error term $(\upsilon_{i,post} - \upsilon_{i,pre})$ and a dummy D. At this point, Ball and Sheridan observe that the inflation target dummy is biased and may attribute positive results to inflation targeting in reducing inflation, even if there is no such effect.[1] To fix this issue, they add the initial condition of the macroeconomic variable also on the right hand side and get the following equation:

[1]The doubt for possible bias relies on the fact that economies with higher initial inflation have greater chances to adopt inflation target. Therefore, $higherX_{i,pre}$, would imply also $higher\upsilon_{i,pre}$, explaining a positive relation of the $error\upsilon_{i,pre}$, with the dummy. However, in the equation, $-\upsilon_{i,pre}$ has a negative sign showing a negative correlation.

$$X_{i,post} - X_{i,pre} = (\eta_{post} - \eta_{pre}) + a_1 D_i + a_2 X_{i,pre} + (\upsilon_{i,post} - \upsilon_{i,pre}),$$

which can be interpreted as an OLS estimator

$$X_{post} - X_{pre} = a_0 + a_1 D + a_2 X_{pre} + \epsilon$$

The authors argue that since economies experiencing high levels of inflation were more attracted by inflation targeting regime, a bigger improvement compared to non targeters may be attributed to temporary factors and their initial performance. For this reason, the last equation accounts for the reversion to the $meanX_{pre}$.